KING COVE AIRPORT UPGRADE ANALYSIS

King Cove, Alaska

Final

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Prepared for

Aleutians East Borough

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SUMMARY

The Aleutians East Borough is studying alternatives for improving transportation access to the City of King Cove. This report addresses alternatives to improve access to King Cove by air. The community of King Cove has expressed the need for larger aircraft to be able to travel to and from King Cove. Because the existing airport is only suitable for operations by small aircraft operating under Visual Flight Rules (VFR) conditions, the existing airport must be upgraded or a new, improved airport must be built at a new location in order to meet this need.

The evaluation of these options included: 1) a review of the Federal Aviation Administration (FAA) design criteria for airports, 2) determining the feasibility of upgrading the existing airport, 3) the identification of alternative sites, and 4) a detailed review of the preferred alternative.

The existing airport is not well suited for development of a facility to serve larger aircraft. Improving the existing airport to meet FAA design criteria for larger aircraft would require costly modifications, including regrading the runway safety area (RSA), relocating the water treatment plant building at the west end of the runway, modifying several wellheads, and relocating the system of access roads . In addition, the airport is bordered by excessively rough terrain, which may make future expansion of airport facilities cost prohibitive. Because of the location and the topography surrounding the existing King Cove Airport, upgrading the facility offers no cost savings over constructing a new facility. In fact, it would cost $3.7 million more to improve the existing airport than to build a new airport at a new location, which is estimated to cost $27.1 million. After evaluating the options of upgrading the current airport or building a new airport at another location, it is recommended that a new airport be built at a different site. This option is the most realistic and cost-effective, considering that the current and future availability of funds for improving air access to King Cove is very limited.

The preferred alternative to construct the new airport was identified at Alternative 5, which is located near the Joshua Green River, approximately 15 miles NNW of King Cove. Of all the alternatives considered, this is by far the best choice for the proposed facility, and was the only alternative that would comply with FAA precision approach design standards for larger aircraft. This alternative is also located in an area of relatively flat ground, which is desirable for airport development and future expansion.

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LIST OF EXHIBITS AND APPENDICES

EXHIBITS

APPENDICES

ACRONYMS

AASP	Alaska Aviation System Plan
AC	Advisory Circular
AIP	Airport Improvement Plan
AIR-21	Aviation Investment and Reform Act for the 21st Century
ALP	Airport Layout Plan
AOA	Airport Operations Area
ARC	Airport Reference Code
ARFF	Airport Rescue and Fire Fighting
ATC	Air Traffic Control
BRL	Building Restriction Line
cy	cubic yards
DOT&PF	State of Alaska Department of Transportation and Public Facilities
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
ft	foot or feet
HIRL	High Intensity Runway Lighting
hp	horse power
IFR	Instrument Flight Rules
ILS	Instrument Landing System
KW	kilowatts
lbs	pounds
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MITL	Medium Intensity Taxiway Lighting
MSL	Mean Sea Level
NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport Systems
OFA	Object Free Area
OFZ	Obstacle Free Zone
RPZ	Runway Protection Zone
RSA	Runway Safety Area
SHPO	State Historic Preservation Officer
SREB	Snow Removal Equipment Building
ton/hr	tons per hour
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VOR	Very High Frequency Omnidirectional Range

1. INTRODUCTION

The Aleutians East Borough is studying alternatives for improving the transportation access to the City of King Cove, Alaska **(Exhibits A and B)**. Options under consideration include the following:

- Constructing a road connection between King Cove and the community of Cold Bay, on Native lands, outside the Izembek Wilderness area.
- Providing an ice-capable ferry operating as a day boat between a new ferry terminal in Lenard Harbor near King Cove and a new ferry terminal at Cold Bay connecting to the existing road system.
- Providing improved air access by upgrading the existing King Cove Airport or constructing a new airport at a new site to accommodate large, more demanding aircraft and to provide more reliable service under poor weather conditions such as low ceiling and poor visibility (requiring instrument flight rules [IFR]).

1.1 PURPOSE

The purpose of this report is to address the third option, improved air access, and includes:

- Review of design criteria including design aircraft, airport design requirements, and Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*.
- Analysis of potential to upgrade the existing King Cove Airport.
- Identification of potential alternative airport sites including site selection criteria.
- Detailed review of the preferred alternative (Alternative 5).

1.2 DESCRIPTION OF NEED

The primary means of access to King Cove is by air. The existing King Cove Airport is located approximately 4 miles northeast of King Cove, and is connected to the community by a gravel road. The existing airport was constructed by the State of Alaska, Department of Transportation and Public Facilities (DOT&PF) in the late 1960s. It consists of a graded gravel surface runway 3,000 ft long by 75 ft wide, and a small aircraft parking apron as shown on **Exhibit C-1,** the existing airport layout plan (ALP). The airport is sited in a narrow valley between mountainous terrain rising to elevations in excess of 2,500 ft mean sea level (MSL). The *Alaska Supplement, United States Government Flight Information Publication*, describes the King Cove Airport as follows:

> "Runway condition is not monitored, frequent 15+ knot winds in northeast, east and northwest quadrants which funnel down canyon. Large size gravel on runway, runway soft during spring breakup and heavy rains. Runway 07 slopes up to east end at 1.0% grade."

The airport generally meets standards of an Airport Reference Code (ARC) A-1 (refer to Design Criteria, Section 2.1 of this report). The airport is only suitable for use by small aircraft (less than 12,500 pounds [lbs]), which includes most single-engine and light, twin aircraft operating under VFR. VFR generally means that cloud ceilings are higher than 1,000 feet above the terrain, and visibility is at least 3 miles. (By contrast, properly equipped aircraft can land at Cold Bay Airport in weather conditions as low as a 200-foot ceiling and ½-mile visibility.) Additionally, larger aircraft generally operate safely in much higher crosswind conditions than smaller aircraft (16 knots versus 10 knots). During poor weather conditions (low ceilings, poor visibility due to rain, snow, or fog, and high winds), the reliability of service is low because there are no instrument approach capabilities and/or crosswinds make conditions unsafe for small aircraft. Also, reportedly, these conditions can extend for periods of several days.

2. ANALYSIS OF POTENTIAL ALTERNATIVE SITES

2.1 DESIGN CRITERIA

When federal funds are involved in an Airport Improvement Project (AIP), the FAA requires the planning, design, and construction of the airport to conform to design standards described in Advisory Circular (AC) 150/5300-13, Airport Design, to the extent practical. The design standards outlined in this circular are based on an ARC. The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the most demanding airplane (design aircraft) to operate at the airport on a fairly regular basis (usually a minimum of 100 operations per year).

The ARC has two components relating to the design aircraft. The first component, depicted by a letter, is the aircraft approach category that relates to the aircraft approach speed. The second component, depicted by a roman numeral, is the airport design group and relates to airplane wing span. Generally, aircraft approach speeds relate to runways and runway-related facilities. Airplane wing span primarily relates to separation criteria between runways, taxiways, apron areas, and a building restriction line (BRL).

2.1.1 Design Aircraft

The design aircraft used in this King Cove Airport Upgrade Analysis is the Boeing 737-200, which establishes the requirement for an airport meeting the criteria for ARC C-III. Alaska Airlines acquired their fleet of Boeing 737-200 Combi aircraft in the early 1980s. The Boeing 737-200 is one of the most durable and widely used jet aircraft produced. With regular and major maintenance overhaul, the aircraft can be expected to be in service for up to 30 years, well into the next century.

2.1.2 Runway Length Analysis

Tables 1 and **2** depict runway length requirements for the Boeing 737-200 aircraft equipped with JT8D-15 engines, operating with fuel reserves required en route from King Cove to Anchorage (approximately 625 statute miles) at MSL, standard day (59°F), and zero wind. Under these operating conditions, the design aircraft would require a runway length of approximately 5,600 ft for takeoff. From **Tables 1** and **2,** it is also apparent the other aircraft such as the B-727, DC6 (for cargo operations), L-188 (Lockheed Electra), and the L-100-30 (Hercules) could also be operated from this runway length. Less demanding aircraft commonly used in Alaska, including the Swearingen Metro Liners, Beech 1900, Dash 8, Saab 340, Convair 240, and Learjet medevac aircraft would also be accommodated by an airport meeting ARC C-III design standards.

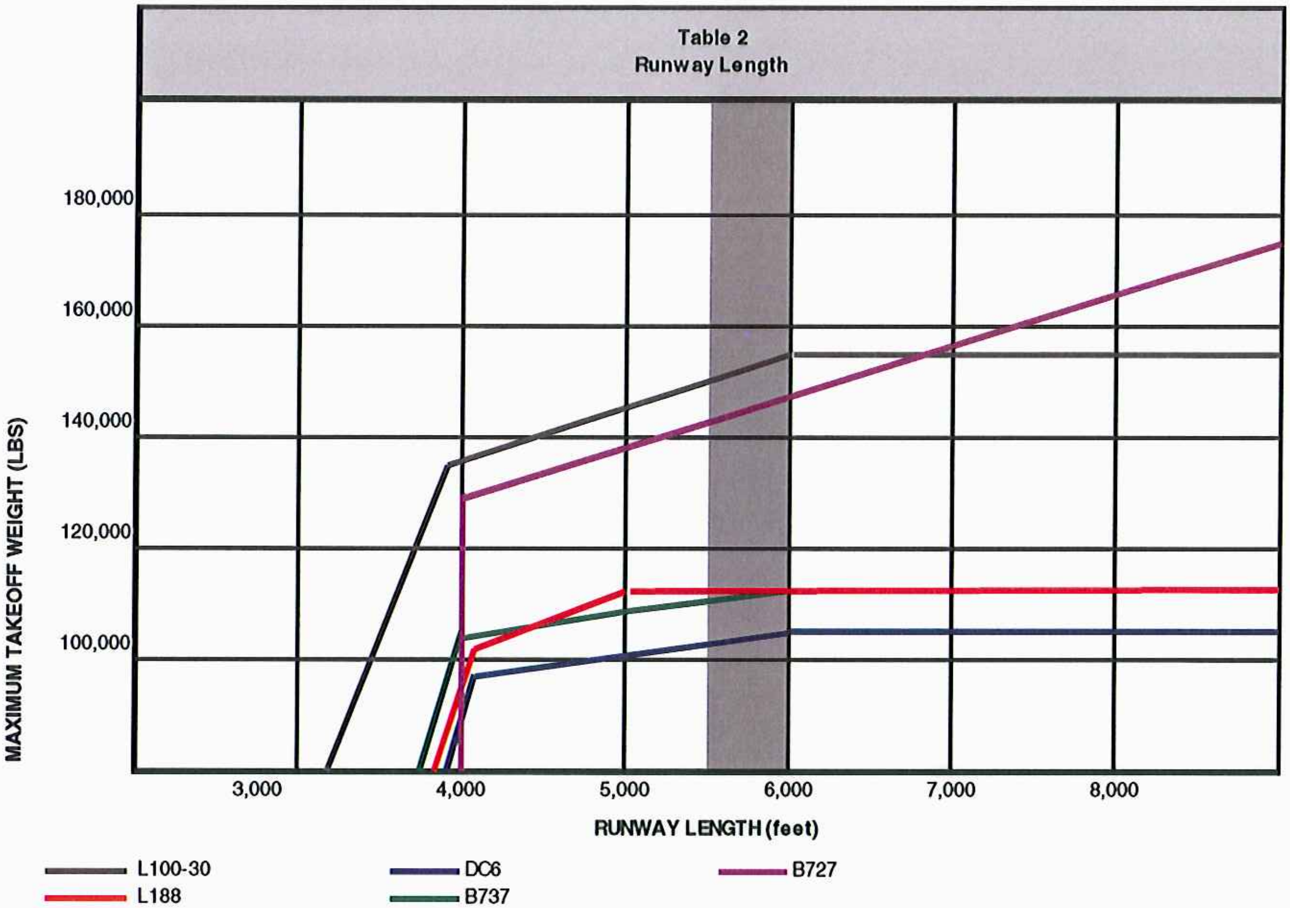
Table 1
Runway Length Analysis

AIRCRAFT	B 727 - 100 C		B 737 - 200		B 737 - 200 C		L-100-30
Engine	JT8D-7	JT8D-9	JT8D-9	JT8D-15	JT8D-9	JT8D-15	501-D22A
Maximum Ramp Weight (lbs)	161,000	170,000	116,000	116,000	116,000	116,000	155,800
Maximum Takeoff Weight (lbs)	160,500	169,500	115,500	115,500	115,500	115,500	155,000
Maximum Landing Weight (lbs)	137,500	142,500	103,000	103,000	103,000	103,000	135,000
Maximum Structural Payload (lbs)	30,400	40,900	34,800	34,800	31,900	35,400	49,000
Operating Empty Weight (lbs)	87,600	87,700	60,200	60,200	63,100	59,600	78,000
Seating	106	125	130	115	115	(Cargo	N/A[6]
Passenger Payload	21,200	25,000	26,000	26,000	24,000	Version)	N/A[6]
RUNWAY LENGTH - TAKEOFF (feet)							
Maximum Takeoff Weight	7,400[1]	7,800[1]	7,700[2]	6,100[3]	8,800[3]	6,600[1]	6,100[1]
Maximum Payload 625 Miles - 2-Hour Fuel Reserve (lbs)	5,700[1]	6,100[1]	9,000[1]	5,600[1]	8,100	6,500[1]	5,000[1]
Passenger Payload 625 Miles - 2-Hour Fuel Reserve (lbs)	4,900[1]	4,900[1]	6,700[1]	5,000[1]	4000[1]	N/A[6]	N/A[6]
AIRCRAFT WEIGHT - TAKEOFF (lbs)							
RUNWAY LENGTH							
6,500 feet	157,500	163,000	104,000	115,000	104,000	115,000	MTOW
6,000 feet	152,500	156,500	102,500	112,000	102,500	112,000	154,000
5,500 feet	146,500,	151,000	99,000	109,500			
RUNWAY LENGTH - LANDING (lbs)							
Maximum Landing Weight	4,900[1]	5,600[1]	5,400[1]	4,900[1]	5,800[1]	5,700[1]	5,500[1]
AIRCRAFT WEIGHT - LANDING (lbs)							
Runway Length	40° Flaps	30° Flaps	40° Flaps	40° Flaps	30° Flaps	30° Flaps	100% Flaps
5,500 feet	MLW	140,00	MLW	MLW	98,000	MLW	135,000
5,500 feet	MLW	125,000	94,500	MLW	86,500	101,000	122,000
4,500 feet	121,000	108,00	84,000	97,000	76,000	93,000	109,000
4,000 feet	105,000	(4)	72,000	83,000	(5)	81,000	96,000

Standard day, wet runway, zero wind, zero runway gradient, 25; elevation (pressure altitude), 625 statute mile haul route

Notes:

1. Average aircraft data were used as various models and configurations are currently in use.
2. Based on full passenger load for a takeoff weight of 111,000 lbs.
3. Based on full passenger load for a takeoff weight of 112,5000 lbs.
4. Minimum length = 4,400 ft at 105,000 landing weight.
5. 4,000 ft wet runway results in impractical payload conditions, dry runway allows 77,000 lbs landing weight.
6. Cargo Version.



2.1.3 Other Airport Design Standards

In addition to the required runway length for the design aircraft, other airport layout and separation standards are defined in AC 150/5300-13. These include:

Runway Safety Area (RSA) This is a surface surrounding the runway serving a function similar to that of a highway shoulder. FAA standards require that the RSA be cleared, graded, and drained. Under dry conditions, the RSA must be capable of supporting the occasional passage of aircraft, thereby reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. To meet ARC C-III standards with precision approach capabilities, this surface must be 500 ft wide and extend at least 1,000 ft beyond each end of the runway. The RSA represents a significant portion of airport capital and maintenance costs.

Object Free Area (OFA) and Obstacle Free Zone (OFZ) These are areas surrounding the runway surface which FAA standards require to be clear of objects and object penetrations.

Building Restriction Line (BRL) The BRL identifies suitable locations for building areas on the airport, taking into account the requirements of the OFAs, runway protection zones (RPZs), aircraft parking and loading areas, the airport terminal building, and other service areas. For ARC C-III airports with precision approach capabilities, the BRL must be set back 900 ft from the runway centerline.

Runway Protection Zone (RPZ) The RPZ is trapezoidal in shape and centered on the extended runway centerline on both ends of the runway. The RPZ is a controlled activity area within the airport boundaries which is generally cleared of all objects, and is subject to rules prohibiting most land uses except agricultural activities.

Table 3 identifies the dimensional criteria for an ARC C-III airport and compares this criteria with the existing King Cove Airport. These layout criteria are also used in the alternative site analysis.

Table 3
Airport Design Criteria

ITEM	Existing King Cove Airport	Proposed ARC-III Design Standards
Length (feet)		
Runway	3,600	6,000
Runway Safety Area (beyond runway end)	300	1,000
Runway Object Free Area (beyond runway end)	500	1,000
Width (feet)		
Runway	100	100 (150)
Runway Safety Area	120	500
Runway Object Free Area	500	800
Taxiway	35	50 (75)
Taxiway Safety Area	79	118
Minimum Distance Between (feet)		
Centerline of runway and aircraft parking area	250	770
Centerline of runway to Building Restriction Line or obstruction	250	900

2.1.4 FAR Part 77, Objects Affecting Navigable Airspace

In order to identify obstructions to the safe navigation of aircraft, FAR Part 77, *Objects Affecting Navigable Airspace*, establishes various imaginary surfaces related to the airport runway and approaches. FAR Part 77 applies to both existing and proposed objects, including man-made objects, objects of natural growth, and the natural terrain. Part 77 criteria are shown in **Table 4**. Due to the nature of the proposed King Cove Airport, criteria for an airport larger than utility (Approach Categories C, D, and E), with a precision instrument runway apply to the project.

2.2 ANALYSIS OF POTENTIAL TO UPGRADE KING COVE AIRPORT

Alternative 1 is to improve the existing King Cove Airport (**Exhibit C-1**). The existing King Cove Airport was constructed in the late 1960s and consists of a graded gravel surface and small aircraft parking apron. The existing runway is located in a valley defined by high mountains to the north, south, and west. Winds in this valley are known to be strong, gusty, and unpredictable. The airport lacks lighting, maintenance facilities and equipment, navigational aids, and passenger facilities. The airport generally meets standards for an ARC A-I and is suitable for small aircraft (less than 12,500 lbs) operating only in good weather conditions under VFR.

A community well field has recently been developed in the vicinity of the existing King Cove Airport. The well field consists of several well heads, a water treatment facility, and various access roads (**Exhibit C-2**). Any airport development funded by FAA would require that this well field conform to FAA clearing and obstruction standards.

2.2.1 Discussion of Limitations

The existing King Cove Airport site is substantially substandard in meeting the most current design criteria and is not well suited for development of a facility meeting ARC C-III standards with precision approach capabilities. It is limited by the surrounding terrain to support only visual or possibly non-precision operations. As shown on **Exhibit D**, penetrations to the imaginary surfaces outlined in FAR Part 77 prohibit the existing site from supporting precision approach operations. It is not possible to construct a crosswind runway that would comply with FAR Part 77 standards for visual operations. This concern is especially important because further collection and analysis of wind data may indicate that a crosswind runway is necessary to achieve acceptable wind coverage. Due to the extended periods of poor weather in the region, this limitation would severely impact the facility's usefulness. Furthermore, the excessively rough terrain in the immediate vicinity of the runway may make future expansion of airport facilities cost prohibitive.

Table 4

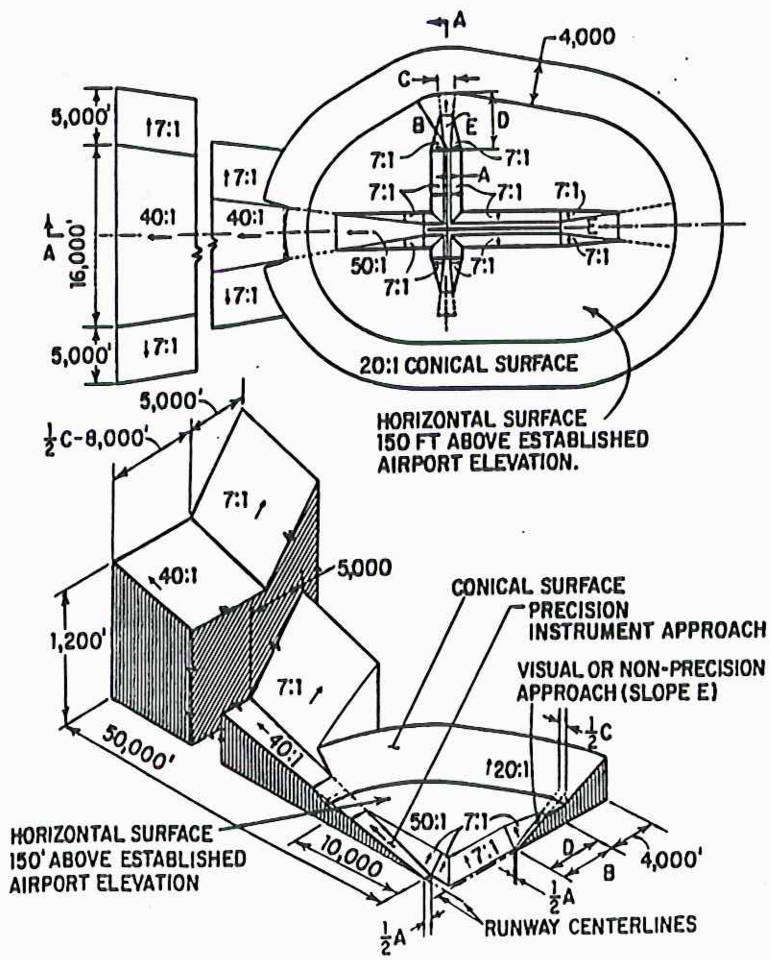
FAR Part 77 Criteria

Dimension	Item	Dimensional standards, ft (see Fig. 18.1): Visual runway — Utility runways‡	Visual runway — Runways larger than utility	Nonprecision instrument runway — Utility runways	Nonprecision instrument runway — Runways larger than utility — Visibility minimums greater than ¾ mi	Nonprecision instrument runway — Runways larger than utility — Visibility minimums as low as ¾ mi	Precision instrument runway
A	Width of primary surface and width of approach surface at inner end	250	500	500	500	1,000	1,000
B	Radius of horizontal surface	5,000	5,000	5,000	10,000	10,000	10,000
C	Approach surface width at end	1,250	1,500	2,000	3,500	4,000	16,000
D	Approach surface length	5,000	5,000	5,000	10,000	10,000	†
E	Approach slope	20:1	20:1	20:1	34:1	34:1	†

*Federal Aviation Administration.

† Precision instrument approach slope is 50:1 for inner 10,000 ft and 40:1 for an additional 40,000 ft.

‡ Runways expected to serve propeller-driven airplanes with maximum certificated takeoff weight of 12,500 lb or less.



ISOMETRIC VIEW OF SECTION A-A

Developing the existing airport into an ARC C-III facility with precision approach capabilities would require modifying the existing well field. This would include relocating the existing water treatment facility out of the BRL, relocating one well head off of the runway, modifying the remaining well heads so they do not extend above the runway elevation and so that aircraft may safely pass over them if they are in the RSA, relocating 1 mile of road to the hydroelectric facility so that it is approximately 1,200 feet from the runway end, and constructing 1.4 miles of restricted access roads to the various well heads.

2.2.2 Capital Costs

Because of the location and the topography surrounding the existing King Cove Airport, upgrading the existing facility to meet ARC C-III standards with precision approach capabilities offers no cost savings over constructing a new facility at a new site. Constructing a new airport at a new location is estimated to cost approximately $27.1 million. Improving the existing airport into an ARC C-III facility would cost approximately $30.8 million, $3.7 million more due to increased costs for RSA grading and the necessary well field modifications (as discussed in Section 3.2) and relocation of the existing water treatment plant. The existing runway is aligned 07/25 **(Exhibit C-1)**, with a deep ravine off the east end and Delta Creek off the west end. A new 6,000-ft-long runway would be realigned to 05/23 **(Exhibit C-2)**. This would be the most economical alignment to construct, but uses little of the existing runway and apron embankments. Also, the existing airport site appears to be surrounded by rough and rocky terrain, and would require considerable excavation to meet RSA grading standards.

There are no other features at the existing site that might be advantageous to construction of an upgraded facility. There are no utility systems, navigational aids or electronic equipment, developed passenger facilities, developed lease lots, or maintenance facilities that would be retained at the upgraded facility.

2.2.3 Operating Costs

Maintenance and operation costs for a new airport at a new location are estimated to be $433,00 per year (see Section 3.3). It is not anticipated that there are any unique features at the existing King Cove Airport which would result in lower operating costs than at any other site. In fact, operating costs at the existing site may be significantly higher than at other sites. Due to its location in a valley surrounded by mountains, the airport is subjected to strong winds and unpredictable weather. It should be anticipated that facilities located here may be subject to excessive blowing and drifting snow, excessive avalanche danger, possible flood hazard, and other undesirable conditions which may increase maintenance costs.

2.2.4 Schedule for Development

The extensive upgrades required at the existing site provide few, if any, advantages over relocating the airport. The existing facilities are of little value for the proposed ARC C-III facility; therefore, the schedule for developing this alternative (including preparation of an airport master plan and environmental assessment [EA]) would be similar to the schedule to develop the other alternatives, outlined in Section 3.4.

2.3 IDENTIFICATION OF POTENTIAL ALTERNATIVE AIRPORT SITES

2.3.1 Airport Site Selection Criteria

Five alternative sites were identified as having characteristics that might be suitable for development of a new King Cove Airport. This analysis was made using the following factors: wind coverage, environmental factors, FAR Part 77, land considerations, topography, and construction cost.

Wind Coverage Each site was rated based on wind coverage calculated using FAA design software. The data used for the analysis were provided by the National Climatic Data Center, and were collected at Cold Bay, Alaska from April 1, 1996, to March 31, 1997. At this time, it is the best available data for the project.

Environmental Factors Several environmental factors were taken into consideration to evaluate the various sites, including impacts to wetlands, terrestrial and marine habitats, and stream crossings; and the potential of bird strike hazard.

FAR Part 77 Each alternative was rated based on its ability to conform to standards prescribed in FAR Part 77 (**Table 4**).

Land Considerations Each alternative was rated based on whether or not it would be located on land that already belongs to the King Cove Corporation.

Topography Each alternative was rated based on the topography in the immediate area of the proposed construction, and how the existing topography would affect the construction and operation of the proposed airport. For instance, alternatives located in rough and uneven areas scored poorly due to the difficulty of construction and operation of airport facilities in these areas. Other elements in this category might be the presence of streams in the area that could be crossed by the runway, terrain that might make future airport expansion difficult, and other considerations that might make navigation unsafe or unpredictable.

Construction Cost

Each alternative was rated in comparison to Alternative 1. The major factor affecting this category is earthwork, specifically rock excavation and backfill.

2.3.2 Wind Rose Analysis

A factor influencing runway orientation and therefore airport location is wind. Ideally, a runway should be aligned with the prevailing wind. The crosswind component of wind direction and velocity is the result in vector which acts at a right angle to the runway. In accordance with AC 150/5300-13, the allowable crosswind component for a runway between 100 and 150 ft in width (ARC C-III) is 16 knots. Wind coverage, along with the various runway alignments, for the six alternative locations is summarized in **Table 5**. The analysis was performed using data collected at Cold Bay (**Appendix A**). These data and the analysis will be updated when information is available from recent installation of wind measuring devices at King Cove.

Table 5
Wind Coverage Summary

Alternative	Magnetic Alignment	True Alignment	Wind Coverage
1	05/23	070/250	71%
2	17/35	003/183	82%
3	07/25	090/270	79%
4	03/21	043/223	69%
5	01/19	027/207	71%
6	16/34	179/359	84%

Note: Data for this analysis were provided by the National Climatic Data Center, and were collected at Cold Bay, Alaska from April 1, 1996, to March 31, 1997.

2.3.3 Description of Alternative Sites

Alternative 2 This alternative would involve decommissioning the existing King Cove Airport and constructing a new ARC C-III facility near Kaslokan Point. The new runway would be oriented approximately 17/35. This alternative would include construction of approximately 11 miles of new access road. This road would begin at the existing airport access road near the existing airport, proceed through the Delta Creek valley, then follow the south shore of Lenard Harbor to the proposed site. This alternative is not the preferred alternative due to penetrations of the imaginary surfaces described in FAR Part 77 **(Exhibit E)**, and the difficulty of constructing the access road to the site. The limited area of the proposed site is also a factor, which might require placing fill in the ocean to construct the RSA to FAA standards.

Alternative 3 This alternative would involve decommissioning the existing King Cove Airport and constructing a new ARC C-III facility north of Lenard Harbor, near the coast. The new runway would be oriented approximately 07/25. This alternative would include construction of approximately 8 miles of new access road. This road would begin at the existing airport access road near the existing airport, proceed through the Delta Creek valley, then follow the north shore of Lenard Harbor to the proposed site. This alternative is not the preferred alternative due to penetrations of the imaginary surfaces described in FAR Part 77 **(Exhibit F)**, which would make IFR operations impossible. This alternative is also located in an area of very rough and uneven ground, which would require large amounts of fill material to be hauled to the site.

Alternative 4 This alternative would involve decommissioning the existing King Cove Airport and constructing a new ARC C-III facility near the shore of Cold Bay, between the villages of King Cove and Cold Bay. The new runway would be oriented approximately 03/21. This alternative would include construction of approximately 15 miles of new access road. This road would begin at the existing airport access road near the existing airport, proceed through the Delta Creek valley, then follow the north shore of Lenard Harbor, then proceed along Cold Bay to the proposed site. This alternative is not the preferred alternative due to penetrations of the imaginary surfaces described in FAR Part 77 **(Exhibit G)**, which would make IFR operations unsafe.

Alternative 5 This alternative is the preferred alternative. It would involve decommissioning the existing King Cove Airport and constructing a new ARC C-III facility between the villages of King Cove and Cold Bay (**Exhibit H**). The new runway would be oriented approximately 01/19. This alignment would provide only 71% wind coverage (**Table 5**), however, it was specifically chosen to avoid obstructions to navigation as defined in FAR Part 77. It is possible to obtain better wind coverage with numerous other alignments. This alternative would include construction of approximately 20 miles of new access road. This road would begin at the existing airport access road near the existing King Cove Airport, proceed through the Delta Creek valley, follow the north shore of Lenard Harbor, then follow the shore of Cold Bay to the proposed site. Of all the alternatives considered, this is the most suitable location for the proposed facility. This site will comply with standards outlined in Part 77 (**Exhibit H**) for a precision approach on Runway 05. It is by far the best choice for possible airport development and is therefore the only viable site for airport development in the vicinity of King Cove. This alternative is also located in an area of relatively flat ground, a desirable condition for airport development and future expansion.

Alternative 6 This alternative would involve decommissioning the existing King Cove Airport and constructing a new ARC C-III facility east of the existing King Cove Airport, near the head of Belkofski Bay. The new runway would be oriented approximately 16/34. This alternative would include construction of approximately 13 miles of new access road. This road would begin at the existing airport access road near the existing King Cove Airport, proceed east to Belkofski Bay, and then generally follow the west shore of Belkofski Bay to the proposed site. This alternative is not the preferred alternative due to penetrations of the imaginary surfaces described in FAR Part 77 (**Exhibit I**), which would make IFR operations unsafe.

Other Sites Other locations, primarily to the east of King Cove, were initially considered in this analysis. However, none of these other sites were found to be superior to the six sites already identified. Consequently, further consideration of these sites was not required.

2.3.4 Site Selection Summary

Each alternative was evaluated for the airport selection criteria using a site selection matrix (**Table 6**). Each category was rated such that the most desirable alternative received a score of 5, and the least desirable received a score of 1. Since this analysis is based on a rating system, it is not necessary for each alternative to have an exclusive score.

Based on this review of the six alternatives, Alternative 5 was identified as the preferred alternative. This is the only alternative that meets FAR Part 77 criteria.

Table 6
Airport Site Selection

	Alternative					
Category	**1**	**2**	**3**	**4**	**5**	**6**
Wind Coverage	4	5	3	1	2	5
Environmental Factors	2	2	2	1	1	1
FAR Part 77	1	1	1	1	5	1
Land Considerations	2	1	2	2	2	2
Topography	1	2	3	3	5	2
Construction Cost	3	4	3	4	5	3
Alternative Total Score	13	15	14	12	20	14

3. DETAILED REVIEW OF PREFERRED ALTERNATIVE

Alternative 5 is the preferred alternative, as shown in **Exhibits J and K**. It would involve construction of a new ARC C-III facility between the villages of King Cove and Cold Bay. The runway would be aligned 01/19, providing 71% wind coverage.

3.1 AIRPORT FACILITIES REQUIREMENTS

Airfield requirements include those necessary facilities and upgrades related to the arrival and departure of aircraft. These include:

- Runways
- Taxiways
- Navigational Aids
- Marking and Lighting
- Other Airport Design Standards
- Join-Use Public Passenger Facility
- Lease Lot Development
- Utility Requirements
- Required Permits

The selection of the appropriate design standards for the development of airfield facilities is based primarily on the characteristics of the aircraft likely to use the airport regularly. It is expected that King Cove Airport would be serviced by Part 121 operators from Anchorage, 625 statute miles from King Cove. The most demanding aircraft expected on this route is the Boeing 737-200, establishing the need for ARC C-III design standards. Design standards for ARC C-III apply to aircraft with wingspans from 79 to 117 ft and approach speeds between 121 and 140 knots, according to FAA AC 150/5300-13, Airport Design. These standards are outlined in **Table 7,** Recommended Airport Design Standards.

3.1.1 Runways

FAA AC 150/5300-13 requires that runway orientation allow use by the design aircraft at least 95% of the time. This criterion is evaluated using a standard wind analysis described in AC 150/5300-13. The allowable crosswind component for a C-III runway is 16 knots. Runway 01/19 is oriented in a northeast-southwest direction, which will accommodate the C-III aircraft 71% of the time. This alignment is not optimal based on wind data collected at Cold Bay, however, due to terrain constraints, it is the best wind coverage obtainable in the vicinity of King Cove. Any other alignments that might provide better wind coverage do not meet obstruction standards set out in FAR Part 77.

Table 7
Recommended Airport Design Standards

Design Element	Recommended Design Standard (feet)
Runway Length	6,000
Runway Width	150
Runway Shoulder Width	10
Runway Safety Area Width	500
Runway Safety Area Length, beyond runway end	1,000
Runway Object Free Area Length, beyond runway end	1,000
Runway Object Free Area Width	800
Runway Centerline to Taxiway/Taxilane Centerline Separation	600
Taxiway Width	75
Taxiway Shoulder Width	20
Taxiway Safety Area Width	118
Taxiway Object Free Area Width	186
Taxilane Object Free Area Width	162
Aircraft Parking Area Setback	770
Runway Protection Zone Length	2,500
Runway Protection Zone Inner Width	1,000
Runway Protection Zone Outer Width	1,750
Building Restriction Line	900
Approach Slope Angle	50:1

It is expected that King Cove would be serviced by Boeing 737 aircraft from Anchorage, 625 statue miles from King Cove. A 737-200 equipped with JT8D-15/15A engines operating with adequate fuel reserves, direct from King Cove to Anchorage at sea level, on a standard day (59°F) with 0% runway gradient, in no wind, requires a minimum runway length of 5,600 ft for takeoff. For this analysis, a runway length of 6,000 ft is used. As shown in **Table 2**, 6,000 ft will accommodate other aircraft such as the B-727, DC6 (for cargo operations), L-188 (Lockheed Electra), and the L-100-30 (Hercules) which could also be operated from this runway length.

King Cove Airport facilities must be adequate for C-III operations; the C-III classification requires a 100-ft-wide runway. However, due to high winds and icy conditions which may be present in the King Cove area, a 150-ft-wide runway is recommended to enhance passenger and aircraft safety.

King Cove Airport would not have Air Traffic Control (ATC). On an uncontrolled runway, it is vital for the pilot of a departing aircraft be able to see the entire runway from the aircraft. For this reason, it is recommended that vertical curves not be used on the runway. Due to the terrain at the site, a straight line grade of not more than 0.8% is recommended. Grades steeper than 0.8% can have a serious, detrimental effect on aircraft takeoff length.

At airports being used by jet-powered aircraft, it is highly desirable to surface the runway with asphalt pavement. Paved surfaces greatly reduce the chances of debris damaging the aircraft during a takeoff or landing operation.

3.1.2 Taxiways

According to FAA design standards, a full length, parallel taxiway is desirable, although it is not required if less than 20,000 operations occur annually at the airport. King Cove Airport would not have a full length, parallel taxiway. The required runway centerline to ramp taxilane centerline separation between Runway 01/19 and the ramp taxilane should be at least 600 ft to comply with standards established in FAA AC 150/5300-13 for airports serving C-III aircraft with precision approach.

Using FAA design standards, taxiways at King Cove should be a least 50 ft wide. Due to the strong crosswind condition and significant ice and snow conditions, it is recommended that taxiways be 75 ft wide.

Two 75-ft-wide taxiways (as shown on **Exhibit L**), would allow access between the runway and the apron. Providing two taxiways allows for increased airport capacity and enhanced emergency response in the event of an aircraft accident or incident. It is recommended that all taxiway and taxilane surfaces be paved in accordance with the runway surface.

A ramp taxilane would be provided adjacent to the aircraft parking apron to accommodate aircraft maneuvering between the apron and taxiways. This taxilane would be 75 ft wide, protected by a 118 ft taxiway safety area.

3.1.3 Navigational Aids

Inclement weather, which frequently occurs on the Alaska Peninsula, is a major factor limiting and affecting airport development at King Cove. Due to the high frequency of IFR flight conditions and the type of aircraft expected to use King Cove Airport, it would be necessary to have precision approach capability at the facility. **Table 4** shows clearing standards prescribed in FAR Part 77 for airports with a precision approach. In general, airports with precision approach capabilities only support their capability from one approach. Precision approach systems are both expensive to purchase and maintain, and providing this capability from opposite directions is often redundant. At King Cove Airport, it is recommended that Runway 01 support precision approach. Runway 19 will not meet FAA standards for precision approach equipment. It is recommended that Runway 19 be used for non-precision or visual approach operations.

Due to King Cove's proximity to Cold Bay, it is anticipated that aircraft destined for King Cove would use the existing Cold Bay Very High Frequency Omnidirectional Range (VOR). The purpose of the VOR is to provide long-range navigation information to the aircraft. VOR navigation uses a very high frequency, day-night, all-weather, static-free radio transmitter to help the pilot establish the course the aircraft is flying. The accuracy of the indicated course alignment is usually excellent — generally on the order of $\pm 1^{\circ}$.

After navigating to the Cold Bay Airport, VOR aircraft would proceed to King Cove Airport and then transition to the Instrument Landing System (ILS) that would be installed at King Cove Airport. ILS is a sophisticated approach and landing aid designed to identify an approach path for exact alignment and descent of an aircraft making a landing. It is a commonly used system for instrument landings. The ILS would be used when the aircraft is less than 25 miles from King Cove Airport.

3.1.4 Marking and Lighting

Due to the precision approach installed at King Cove Airport, airport lighting would include the medium intensity approach lighting system with runway alignment indicator lights (MALSR). This system is recommended for Category I precision instrument approaches. A visual approach slope indicator (VASI) would also be provided to aid in defining the desired glide path in relatively good weather conditions. Many landing accidents that occur in good weather have been attributed to poor ground reference data which caused difficulty in judging height. Threshold lighting would also be provided at King Cove Airport, as well as high intensity runway lighting (HIRL) and medium intensity taxiway lighting (MITL).

Due to the installation of precision approach equipment, FAA guidelines must be met for approach areas at this type of facility.

3.1.5 Other Airport Design Standards

Approach areas are described in several different standards for precision approach facilities. FAR Part 77 describes clearing standards that pertain to airspace above and in the vicinity of the runway. The purpose of FAR Part 77 is to enhance the safety of aircraft operations during a precision approach. These surfaces are designed to identify and prohibit possible obstructions to navigation which may pose a threat to aircraft during a routine ILS approach. **Table 4** summarizes the applicable approach surfaces.

Additional clearing standards, which are outlined in AC 150/5300-13, are designed to enhance the safety of people and property in the immediate vicinity of the runway. The runway should have a three-dimensional OFZ extending 200 ft beyond each runway end, with a width of 400 ft.

The runway area should also be protected by providing a 800-ft-wide OFA along its length, extending 1,000-ft beyond each runway end.

The RPZ is a trapezoidal area located off each end of the runway in which no tall vegetation or structures are allowed. For airports equipped with a specially prepared surface and a precision approach, the RPZ begins 200 ft from the runway end and measures 1,000 ft by 1,750 ft by 2,500 ft. This is the standard configuration for RPZs supporting precision operation runways for both large and small aircraft. RPZ identification is important because FAA recommends that the airport owner acquire or control the RPZ so that all clearing and land use standards may be met without difficulty.

The RSA is a graded area surrounding the runway to enhance safety in the event of an aircraft overshoot, undershoot, or excursion from the runway. Under dry conditions, the RSA must be capable of supporting aircraft. The RSA is centered on the runway centerline. For this project, the RSA measures 500 ft wide and extends 1,000 ft beyond each end of the runway.

The BRL is established to restrict the development of buildings at the airport. It is recommended that the BRL be located 900 ft from the runway centerline.

Much of the traffic at King Cove Airport would be transient, that is, aircraft land at King Cove, stay there for a short period of time while passengers and freight are loaded and unloaded, and then proceed on to other destinations. The aircraft parking apron would measure 240 ft by 1,000 ft, large enough to simultaneously accommodate at least two large aircraft, taxiing aircraft, and maintenance, service, and emergency vehicles. This apron would also provide room for any air taxi, based aircraft, and general aviation activity that might occur in the King Cove area.

Airfield support facilities include those necessary for the handling of aircraft, passengers, cargo, and aircraft operations. They also include airport rescue and fire fighting (ARFF), airport maintenance, a snow removal equipment building (SREB), a joint-use public passenger facility, airport security, and lease lot development. ARFF service would be provided at King Cove Airport by DOT&PF during periods of FAR Part 121 air carrier operations only. When the airport is not being serviced by aircraft with 30 seats or more, ARFF service would not be available. During periods when ARFF service is required, Index A service level would be provided. Index A service requires at least one lightweight truck that can carry 500 pounds of dry chemical or 450 pounds of dry chemical and 50 gallons of water for foam production. DOT&PF may contract with local emergency response services to provide initial response to an aircraft accident or incident at times when ARFF service is not provided by DOT&PF.

King Cove Airport would be classified as a Category II airport because it has scheduled service by FAR Part 121 operators (i.e., air carriers using aircraft with more than 30 seats) during the summer. Federal regulations for Category II airports require an airport security plan in compliance with FAR Part 107 and controlled access to the Airport Operations Area (AOA). Because King Cove is a FAR Part 121 airport, the passenger-boarding security requirements for the air carrier operation are conducted by Alaska Airlines (or other airlines) whenever their jets operate at the airport. Airport security is the responsibility of the Alaska State Troopers; no troopers are assigned to King Cove, but they would respond on an as-needed basis. Routine security patrols would be performed at the airport by DOT&PF maintenance personnel.

To aid in maintaining airport security, the BRL would have a perimeter fence to restrict access to the AOA. The purpose of the fence is to keep vehicles other than aircraft, pedestrians, and wildlife away from sensitive areas of the airport. Providing a perimeter fence is especially critical at an uncontrolled airport like King Cove.

A maintenance facility would be constructed at the airport. This facility would house the maintenance equipment and provide office space for personnel required to provide year-round, uninterrupted operation of the airport. At King Cove Airport, airport operator maintenance personnel would be responsible for all airfield facilities, the aviation parking apron, and airport access roadway. Snow removal, minor runway repairs, runway clearing, and general upkeep of the airport are some of the tasks performed by maintenance personnel. In order to accomplish this, they would need to employ a full-time staff and base several different pieces of equipment at the airport. The major pieces of heavy equipment which would be based at King Cove include a 180 hp motor grader, a 4 cubic yard (cy) wheel loader, a 3,000 ton/hr snowblower, an 18-ft loader power broom, a 10 cy dump truck, and a 200-gallon electronic controlled deicer trailer. Maintenance facilities requirements would be determined from information provided in AC 150/5300-13. The facility would be heated and served by electrical power.

3.1.6 Joint-Use Public Passenger Facility

As described in the Alaska Aviation System Plan (AASP), airport operators do not normally construct joint-use public passenger facilities at airports. Passenger facilities are usually the responsibility of the individual carriers. However, recent changes in federal legislation make terminal facilities at non-hub airports eligible for federal funding.

Due to the location of the King Cove Airport and the type of aircraft expected to serve it, a joint-use public passenger facility is highly desirable. King Cove's seafood processing industry may employ as many as 500 non-residents, workers that would be able to fly to and from King Cove via King Cove Airport. A joint-use public passenger facility would allow for passenger ticketing, baggage handling, restaurant/concession development, restrooms, and airline office space.

It is desirable to make airports as financially self-supporting as possible. The primary tool used to accomplish this is lease lot development. Parties interested in constructing hangars or other commercial facilities are able to lease these lots from the airport operator, thereby generating revenue to support the airport and also providing necessary services at the airport.

3.1.7 Lease Lot Development

At King Cove Airport, lease lot development may be especially desirable due to the community's year-round involvement in commercial fishing. Possible uses of lease lots may be aircraft repair, refrigerated storage for fresh seafood, privately owned aircraft service facilities, or other development.

3.1.8 Utility Requirements

It is recommended that community water service be provided at the airport. In general, lease holders provide their own water system. However, based on the type and size of facility being proposed, a centralized water source would encourage industrial development at the facility. Sewer service could be provided to the airport using holding tanks, septic systems, or community sewer. Generally, leaseholders provide their own sewage removal. The vast majority of homes in King Cove have access to complete plumbing and the public sewer system; and King Cove Airport has the potential to support commercial shipping activity, making adequate plumbing and sewage facilities highly desirable.

It is recommended that telephone service be provided at the airport; it should be provided by the local telephone utility within the passenger terminal facility. If a need is demonstrated, this utility should be able to expand to allow use by lease lot holders at their facilities.

The City of King Cove provides electrical power to the village. The utility is owned and operated by the city. Expansions at the airport would require significant electrical power, which should be provided by generators at the airport site A 250 KW generator would be the minimum required for airport electrical power.

3.1.9 Required Permits

Based on the preliminary information gathered for this report, it is anticipated that the following permits would need to be obtained for the project.

1. U.S. Army Corps of Engineers (USACE) Section 404 Permit.
2. Coastal Consistency Determination from the State of Alaska and the Aleutians East Coastal Resource Service Area.
3. National Pollutant Discharge Elimination System (NPDES) General Permit for construction activities in Alaska from the U.S. Environmental Protection Agency (EPA).
4. Threatened and Endangered Species Clearance from the U.S. Fish and Wildlife Service (USFWS).
5. USACE Section 401 Water Quality Certification.

6. State of Alaska Department of Environmental Conservation (ADEC) plan review of water and sewer systems.
7. State Historic Preservation Officer (SHPO) Clearance from the State of Alaska.

3.2 CAPITAL COSTS OF THE FACILITY

The total cost of constructing an ARC C-III facility as described in this report is approximately $27.1 million (**Table 8**). This estimate was calculated using preliminary engineering information and historical construction cost data of similar facilities in the region.

As shown in **Table 8,** approximately 40% of the project cost ($10 million) is attributed to RSA grading. A geotechnical report prepared by Duane Miller and Associates (**Appendix B**), indicates that soils in the vicinity of Alternative 5 are predominantly sandy gravel and gravelly sand, with varying amounts of interstitial silt. Volcanic ash mixed with organic silt blankets the area. This blanket of ash varies in depth from 1 to 3 ft along the length of the runway.

Table 8
Preliminary Construction Cost Estimate

Item	Cost	
Mobilization and Demobilization	$	500,000
RSA Grading	$	10,000,000
Runway and Taxiway Paving	$	1,300,000
Airport Lighting	$	400,000
Ramp	$	1,800,000
Culverts and Drainage	$	500,000
ARFF, SREB, and Emergency Standby Power	$	1,500,000
Security Fencing	$	800,000
Terminal Building	$	750,000
Access Road	$	1,280,000
Utility Development	$	250,000
Miscellaneous Items	$	250,000
Equipment	$	1,320,000
Planning/Environmental Assessment	$	500,000
Design Engineering (8%)	$	1,600,000
Construction Administration (6%)	$	1,200,000
Contingency (15%)	$	3,100,000
Total Construction Cost	$	27,050,000

According to the report, the sandy gravel and gravelly sand materials are expected to be suitable for embankment construction, but the volcanic ash is unsuitable for use as a fill material. Material suitable for crushing into base course may be obtained by using a 3-inch Grizzly on the silty sand/sandy silt material. Additional crushed rock sources are present about 5 miles south along the proposed access road, which reportedly contains a nearly unlimited supply of material suitable for crushing.

The plan and profile sheets (**Exhibits L and M**) show a representative vertical alignment designed in accordance with FAA standards outlined in AC 150/5300-13. A typical section is shown in **Exhibit N**. Clearing standards prescribed in FAR Part 77 require cut sections be graded to an elevation below that of the runway centerline, for a width of 1,000 ft, with 7:1 slopes. Embankment construction requires that the RSA be graded as shown on **Exhibit N**.

3.3 MAINTENANCE AND OPERATING COSTS

Maintenance and operating costs for King Cove Airport are expected to be approximately $433,000 per year (**Table 9**). This is based on operating expenses at the Cold Bay, Sand Point, Unalaska, and Dillingham airports. These airports are similar in size and function to the proposed King Cove Airport. The estimated cost includes compensation for three full-time maintenance personnel, supplies, travel and training, and other non-grant services and charges.

Table 9
Preliminary Maintenance and Operations Cost Estimate

Personnel (3 full-time equivalent)	$	225,000
Supplies	$	50,000
Other Non-Grant Services & Charges	$	150,000
Travel & Training	$	8,000
Total Annual Operating Costs	$	433,000
Other Comparable		
Cold Bay Airport	$	605,000
Unalaska Airport	$	493,000
Dillingham Airport	$	756,000
Sand Point (contract)	$	110,680

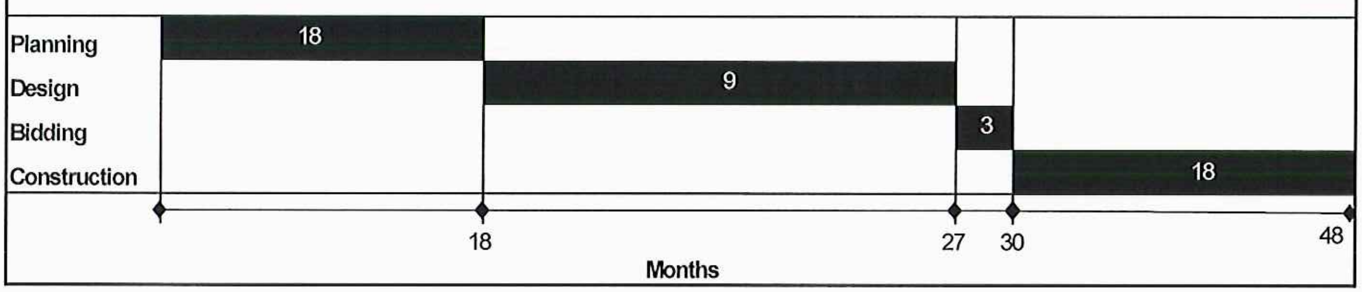
These categories account for all aspects of airport maintenance and operation costs, including snow removal, equipment repair and operation, periodic repairs to paved and graded surfaces, maintenance and operation of navigational aids, and maintenance of other airport facilities. The purchase cost of maintenance equipment would be approximately $1.3 million, and would include items outlined in **Table 10**.

Table 10 Maintenance Equipment Purchase Cost Estimate	
Motor Grader (180 hp)	$ 190,000
Wheel Loader (4 cy)	$ 230,000
Snowblower (3,000 tons/hr)	$ 350,000
Broom (18-ft Loader Mounted)	$ 100,000
Dump Truck (10-12 cy)	$ 100,000
ARFF Vehicle (Index A)	$ 250,000
Deicing Tractor (2,000 gal w/electronic controls)	$ 60,000
Total Equipment Cost	$ 1,280,000

3.4 SCHEDULE

It is estimated that the planning, design, bidding, and construction of the proposed King Cove Airport would take approximately four years (**Table 11**).

Table 11
Development Schedule



Planning for the project would involve preparing a King Cove Airport Master Plan in accordance with AC 150/5070-6, Airport Master Plans. The purpose of the master plan is to identify and address engineering, environmental, economic, social, and political factors which may affect the project. In order for the project to be eligible for federal Airport Improvement Plan (AIP) funds (either presently or in the future), the master plan and EA or possibly an Environmental Impact Statement (EIS) would need to be completed and then reviewed and approved by FAA. It is estimated that the airport master planning and environmental phase would last approximately 18 months.

After the airport master plan is complete, detailed engineering design may begin. The purpose of engineering design is to prepare construction plans and specifications as outlined in the airport master plan. At this stage, detailed design would occur. That is, the documents that are produced would be the final engineering documents. It is anticipated that design would take nine months.

Following the design phase, the owner would engage in bidding activities. This phase includes advertising the project, accepting bids from contractors, reviewing the bids, and awarding the construction contract. It is anticipated that bidding would take three months.

The final phase of the project is the actual construction of the facility. Based on historical data, it is anticipated that construction of the proposed King Cove Airport would take 18 months.

3.5 SINKING FUND REQUIREMENTS

An analysis of the 40-year life cycle cost of the proposed King Cove Airport indicates that the Uniform Equivalent Annual Cost of the facility is approximately $1.9 million (**Table 12**). This was calculated by including construction costs, annual operating costs and the initial capital cost for equipment, with a federally accepted rate of return of 5%. This figure represents an annual cost of the proposed King Cove Airport for each of the 40 years it is considered to have useful life.

Table 12
40-Year Life Cycle Cost Estimate

Present Value	$ 32,470,000.00
Uniform Equivalent Annual Cost	$ 1,892,000.00

3.6 POTENTIAL TO OBTAIN LONG-TERM FAA FINANCIAL ASSISTANCE

Most of the funds for capital construction projects at Alaska airports have come from the AIP. The program will expire in the year 2000, but most certainly will be renewed with a similar program (e.g., AIR-21 [Aviation Investment and Reform Act for the 21st Century]) funded at similar (or higher) levels. The source of AIP funding is the Airport and Airway Trust Fund. The trust fund concept guarantees a stable funding source, and users pay for the services they receive. Taxes (user fees) are collected from the various segments of the aviation community and placed in the trust fund. These taxes include a 10% tax on airline tickets, a 6.25% tax on freight waybills, a $6 international departure fee per passenger, a $.15 per gallon tax on general aviation fuel sales, and a $1.75 per gallon tax on jet fuel sales. Through amendments of the Airport and Airway Improvement Act of 1982, Congress controls the distribution of these funds to eligible airports in the United States.

Alaska receives AIP funding apportionments by each of four categories, as described below, plus a category allocated at the FAA's discretion. The funding is then disbursed according to the DOT&PF's approved AIP spending plan.

To be eligible for AIP grant funding, an airport must be included in the National Plan of Integrated Airport Systems (NPIAS). NPIAS entry criteria include all commercial service airports with scheduled passenger service that annually enplane at least 2,500 passengers, all public-owned airports designated by FAA as reliever airports, and many public-owned general aviation airports. The FAA prepares and publishes the NPIAS every two years.

The AIP will fund a variety of airport projects including airport planning and design, airport development projects, and maintenance equipment. Eligible development projects include airfield design and construction activities, land acquisition, lighting, navigational aids, and the purchase of snow removal equipment. An important requirement of the AIP is that for an airport to be eligible for grant funding, an airport master plan, including an EA or EIS, must first be completed and approved by FAA. With restrictions, the program will participate in maintenance building and terminal development. For Alaska, the federal share is 93.75% of the total project cost.

Under the rules of the AIP, airports are categorized essentially according to the number of passenger enplanements received. Airports fall into the following categories:

- **Primary Commercial Service Airports** are publicly owned airports that enplane over 10,000 passengers annually and receive scheduled service.

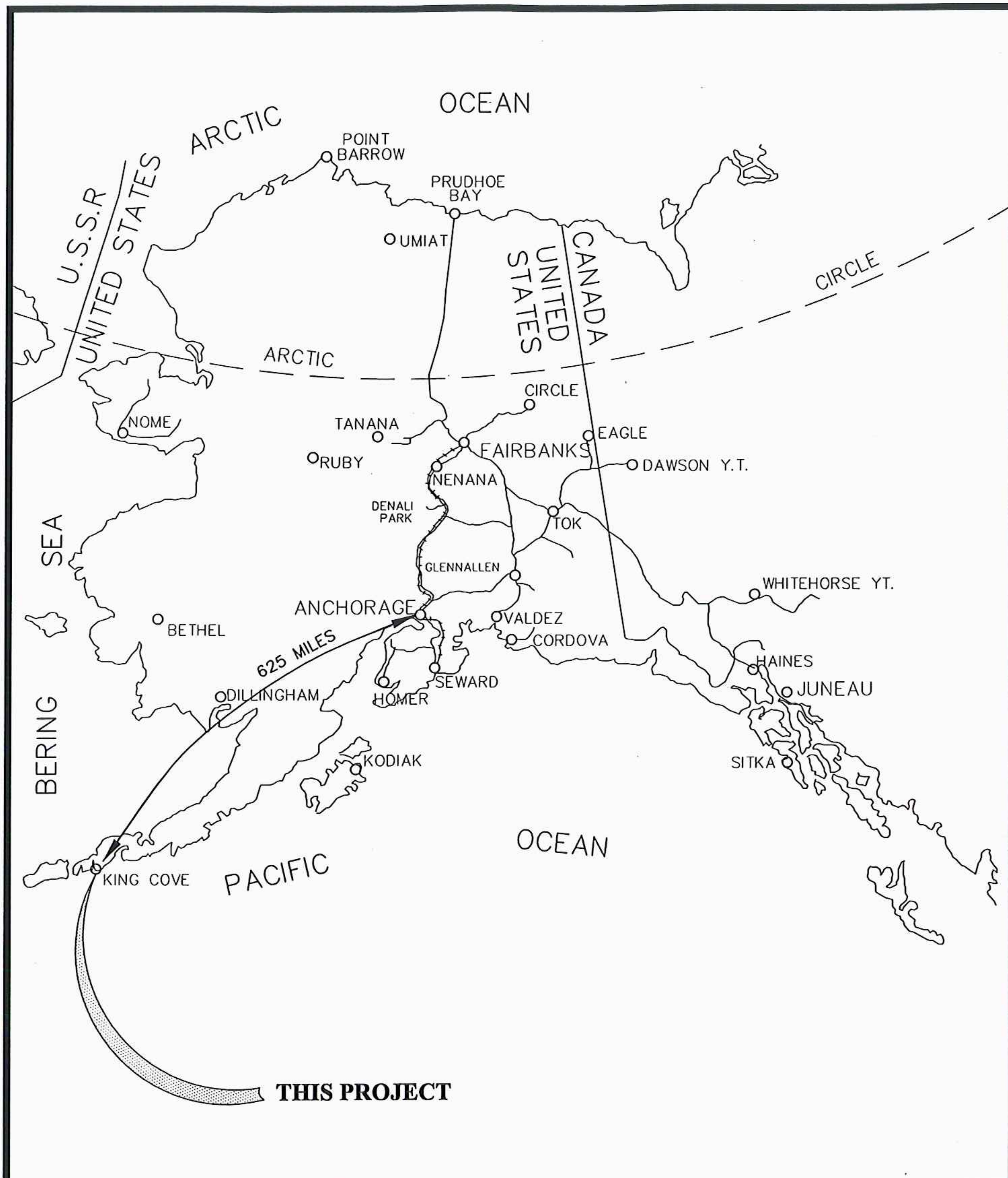
- **Cargo Service Airports** are airports that annually receive at least 100 million lbs of landed weight of aircraft with an all-cargo configuration. In Alaska, this generally only applies to the Anchorage and Fairbanks International Airports.

- **Alaska Supplemental** includes non-primary/commercial service and non-commercial service airports. Alaska's portion in FY 98 was $10 million in supplemental funding.

- **Discretionary** is the final source of AIP funding available to Alaska airports. These are funds specially allocated at the FAA's discretion, generally on a "first come, first serve" basis, with certain provisions mandated by the legislation.

The AASP Update identified the need for major improvements to the 296 public airports owned and operated by the DOT&PF and various local governments in Alaska. Additionally, the plan describes the criteria for ranking competing improvement projects. In general, the needs are large and the funds are limited. It is unlikely that AIP funds would be available to completely fund a new King Cove Airport, located just 10 miles from the existing Cold Bay Airport.

EXHIBITS



USKH

ARCHITECTURE • ENGINEERING
LAND SURVEYING • PLANNING

KING COVE AIRPORT ANALYSIS LOCATION MAP

EXHIBIT A

1999 AUGUST

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LAND SURVEYING • PLANNING

KING COVE AIRPORT ANALYSIS VICINITY MAP

EXHIBIT B

1999 AUGUST

KING COVE AIRPORT ANALYSIS
EXISTING KING COVE AIRPORT LAYOUT PLAN

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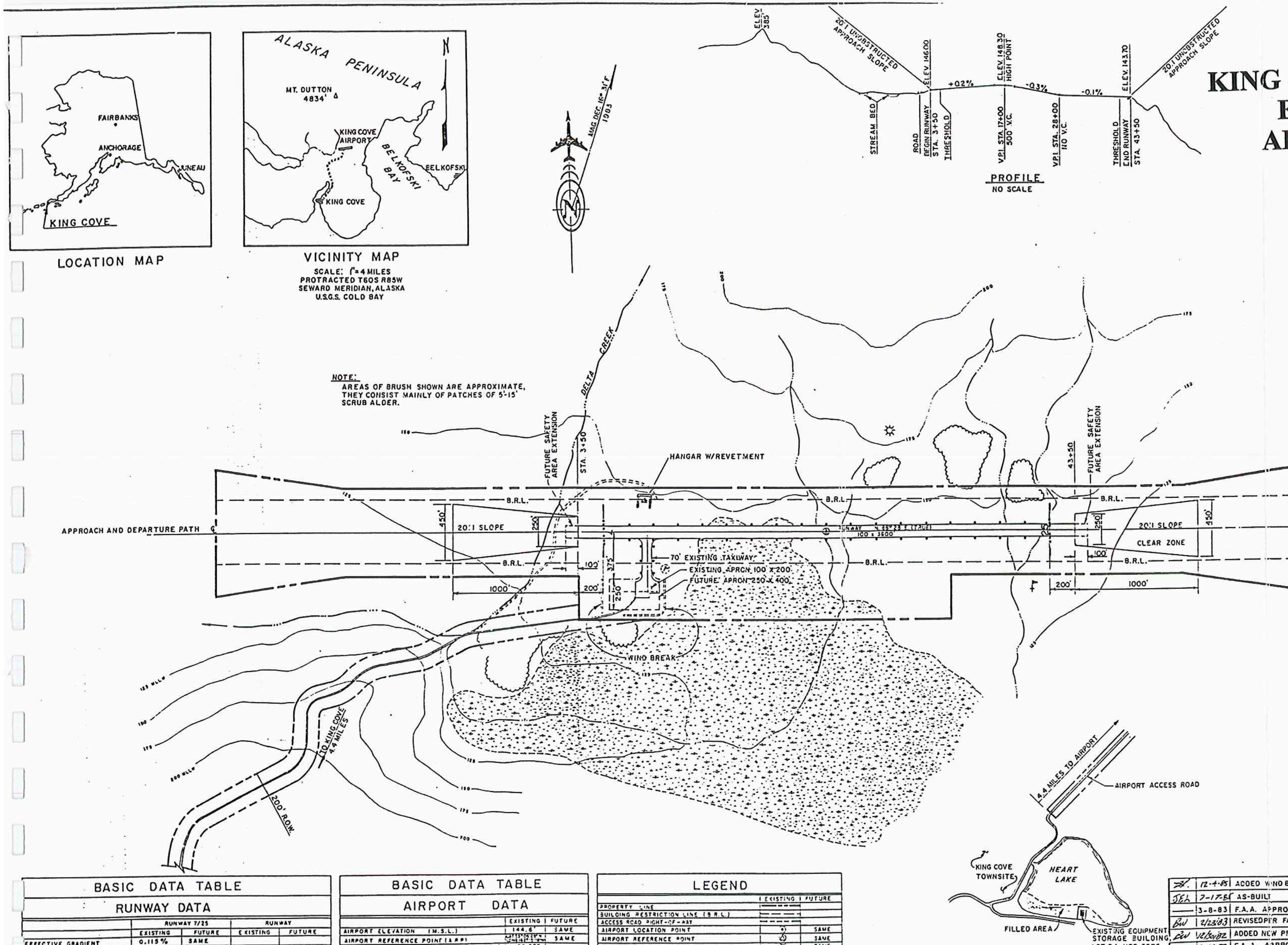
LAND SURVEYING • PLANNING

EXHIBIT C-1
1999 AUGUST



NOTES:
1. NO WIND DATA AVAILABLE FOR THIS LOCATION BUT AIRPORT IS ALIGNED WITH THE REPORTED PREVAILING WIND DIRECTION.
2. ALL BEARINGS SHOWN ARE TRUE BEARINGS.
3. CONTOURS & PROFILE ARE BASED UPON M.L.L.W. DATUM WHICH IS 3.70 FEET BELOW M.S.L.
4. SEE DETAIL FOR EQUIPMENT BUILDING LAYOUT.

DEVIATION FROM DESIGN STANDARDS

DESCRIPTION	STANDARD	FUTURE	EXISTING
RUNWAY SAFETY AREA WIDTH	150'	150'	120'
RUNWAY SAFETY AREA EACH END	300'	300'	200'
BRL (NORTH SIDE)	250'	250'	HANGAR PENETRATES
TAXIWAY SAFETY AREA WIDTH	79'	79'	70'

BASIC DATA TABLE
RUNWAY DATA

	RUNWAY 7/25		RUNWAY	
	EXISTING	FUTURE	EXISTING	FUTURE
EFFECTIVE GRADIENT	0.115%	SAME		
% WIND COVERAGE	NOT AVAILABLE	NOT AVAILABLE		
[illegible]UMENT RUNWAY	NO	NO		
[illegible]AY SURFACE	GRAVEL	GRAVEL		
[illegible]ENT STRENGTH	NOT APPLICABLE	NOT APPLICABLE		
[illegible]ROACH SURFACES	20:1	20:1		
RUNWAY LIGHTING	REFLECTIVE	SAME		
RUNWAY MARKING	NONE	NONE		
NAVIGATION AIDS	NONE			
RUNWAY SAFETY AREA	120 X 4000	150 X 4200		
RUNWAY DIMENSION	100 X 3600	SAME		

BASIC DATA TABLE
AIRPORT DATA

	EXISTING	FUTURE
AIRPORT ELEVATION (M.S.L.)	144.6'	SAME
AIRPORT REFERENCE POINT (A.R.P.)	[illegible]	SAME
MEAN DAILY MAX. TEMP. HOTTEST MO. (COLD BAY)	55.2°F	
TAXIWAY LIGHTING	NONE	NONE
RAMP LIGHTING	NONE	NONE
NAVIGATION AIDS	NONE	
DESIGN TYPE	GEN UTIL. I	SAME
AIRPLANE DESIGN GROUP	I	II
APPROACH CATEGORY	B	B

LEGEND

	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE (B.R.L.)		
ACCESS ROAD RIGHT-OF-WAY		
AIRPORT LOCATION POINT		SAME
AIRPORT REFERENCE POINT		SAME
WIND CONE & SEGMENTED CIRCLE		SAME
WIND CONE		
ROADWAYS		
EXISTING GROUND CONTOURS		SAME
BRUSH		SAME
ROTATING BEACON	NONE	
DRAINAGE SWALE		SAME
BUILDINGS		
SWAMP		SAME
REFLECTIVE MARKER		SAME
THRESHOLD MARKER		
RUNWAY BOUNDARY MARKERS		

REVISIONS

BY	DATE	CHANGE
—	8-27-86	F.A.A. APPROVED
[initials]	8-11-86	CHANGE FROM TRANSPORT TO UTILITY DIMENSIONS

REVISIONS

BY	DATE	CHANGE
[initials]	12-4-85	ADDED WIND BREAK, MOVED FUTURE APRON
JEL	7-17-85	AS-BUILT
—	3-8-83	F.A.A. APPROVED
BW	2/23/83	REVISED PER FAA COMMENTS
BW	12/30/82	ADDED NEW PROPERTY LIMITS
—	8-14-79	F.A.A. APPROVED
[initials]	4-6-79	RELOCATED EQUIPMENT STORAGE BLDG.
	12/12/78	F.A.A. APPROVED
[initials]	11-27-78	CHANGED CLEAR ZONE LOCATION, ADDED FUTURE RUNWAY SAFETY AREA
[initials]	10-25-78	ADDED FUTURE EQUIPMENT STORAGE BUILDING
—	2/27/78	FAA APPROVED
[initials]	2-15-78	CHANGED CLEAR ZONE AND FUTURE APRON LOCATION, REMOVED FUTURE TAXIWAY, GENERAL UPDATING.

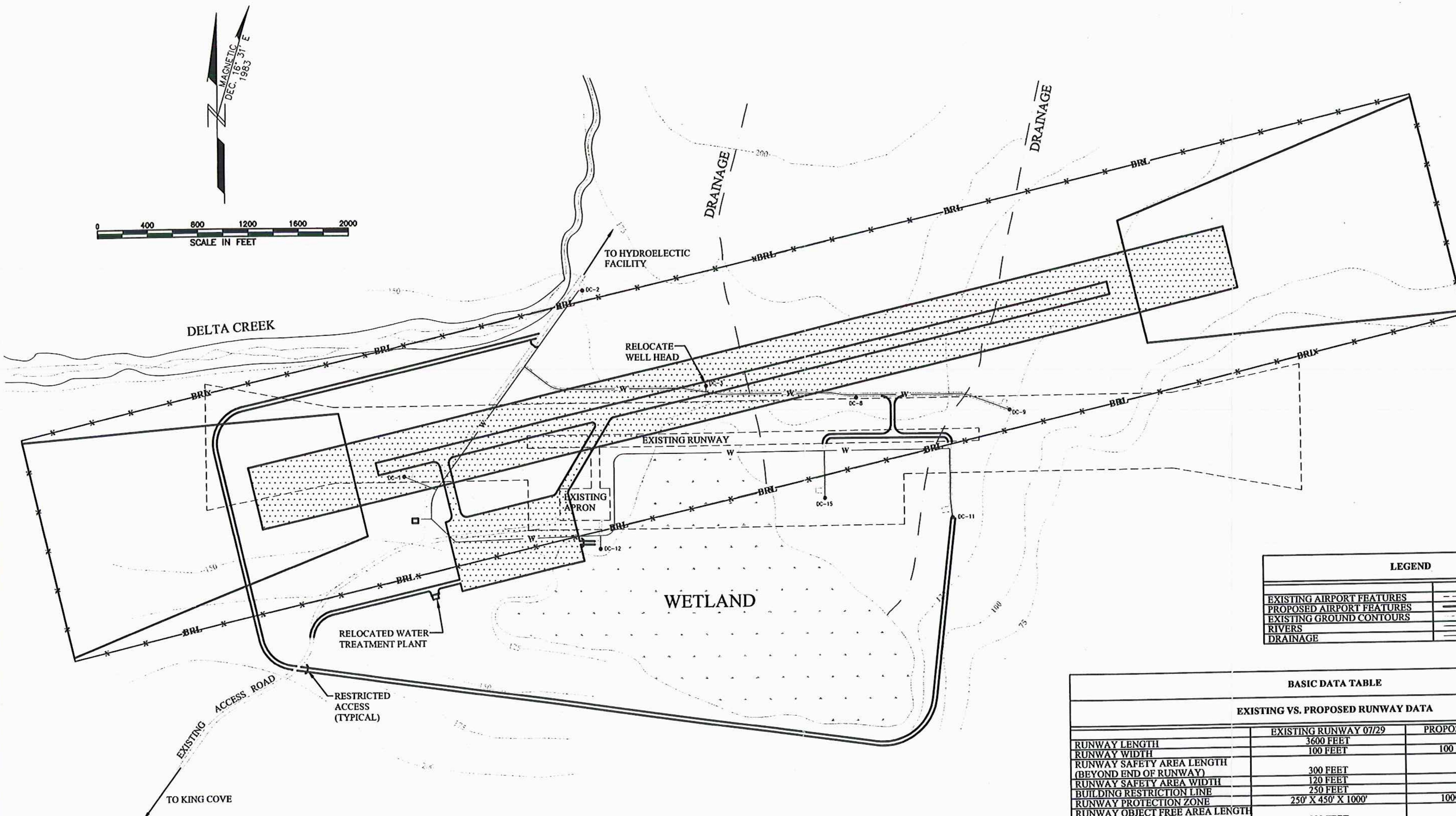
THIS DRAWING SUPERSEDES AIRPORT LAYOUT PLAN DATE 3-22-67

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
DIVISION OF AVIATION—DESIGN AND CONSTRUCTION

KING COVE AIRPORT
KING COVE, ALASKA
AIRPORT LAYOUT PLAN

APPROVED: [signature] JAMES [illegible] RHODE, P.E. — CHIEF DESIGN ENGINEER
APPROVED: [signature] DANIEL J. [illegible], P.E. — TRUNK AIRPORTS ENGINEER

SCALE: 1" = 400' | DESIGNED: [initials] | DRAWN: CRE | CHECKED: RHW | DATE: 10-31-77 | SHEET 1 OF 1



LEGEND

EXISTING AIRPORT FEATURES	- - - -
PROPOSED AIRPORT FEATURES	———
EXISTING GROUND CONTOURS	- · - · -
RIVERS	═══
DRAINAGE	— — —

BASIC DATA TABLE

EXISTING VS. PROPOSED RUNWAY DATA

	EXISTING RUNWAY 07/29	PROPOSED RUNWAY 05/23
RUNWAY LENGTH	3600 FEET	6000 FEET
RUNWAY WIDTH	100 FEET	100 FEET (150 FEET)[1]
RUNWAY SAFETY AREA LENGTH (BEYOND END OF RUNWAY)	300 FEET	1000 FEET
RUNWAY SAFETY AREA WIDTH	120 FEET	500 FEET
BUILDING RESTRICTION LINE	250 FEET	900 FEET
RUNWAY PROTECTION ZONE	250' X 450' X 1000'	1000' X 1750' X 2500'
RUNWAY OBJECT FREE AREA LENGTH (BEYOND RUNWAY END)	300 FEET	1000 FEET
RUNWAY OBJECT FREE AREA WIDTH	500 FEET	800 FEET

1) WIDTH RECOMMENDED BECAUSE OF CROSSWINDS, ICE, AND SNOW.

KING COVE AIRPORT ANALYSIS EXISTING AIRPORT with PROPOSED ARC C-III AIRPORT

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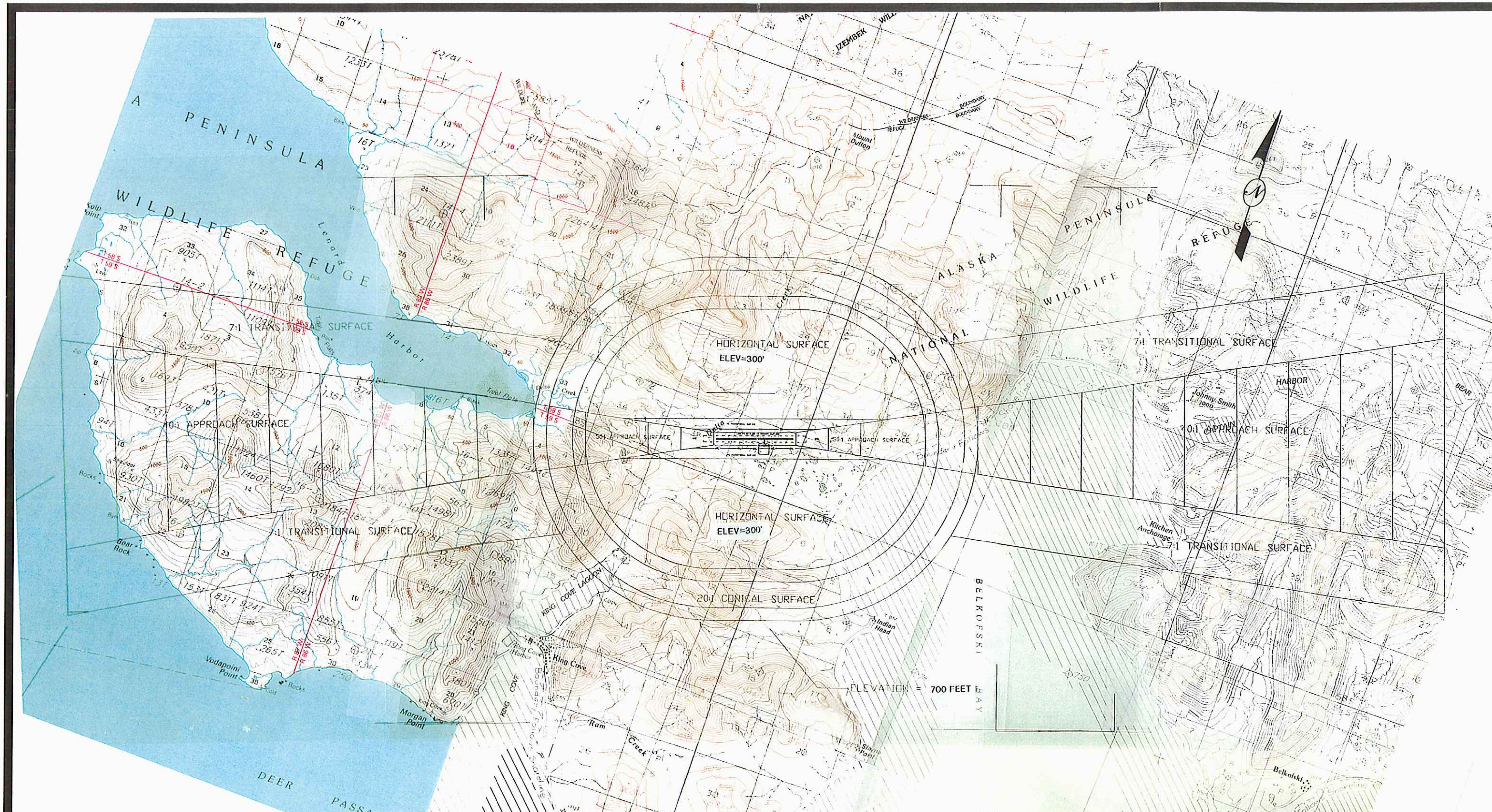
EXHIBIT C-2

1999 AUGUST

I:\582701\AIRPORT\DWGS\EXHIBITC.dwg



KING COVE AIRPORT ANALYSIS
ALTERNATIVE 1
IMPROVE EXISTING AIRPORT

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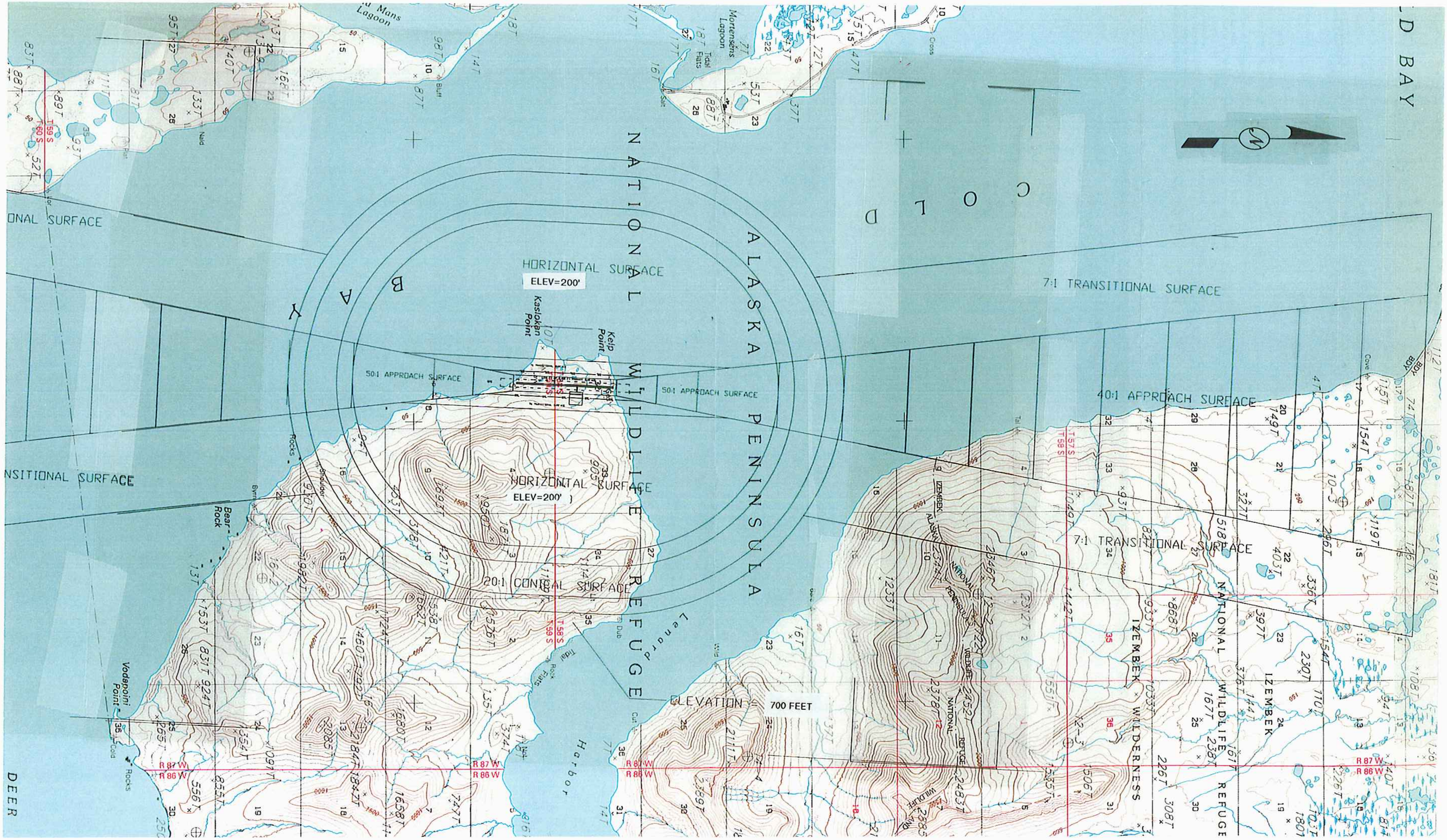
EXHIBIT
D

1999
AUGUST



KING COVE AIRPORT ANALYSIS
ALTERNATIVE 2
KASLOKAN POINT LOCATION

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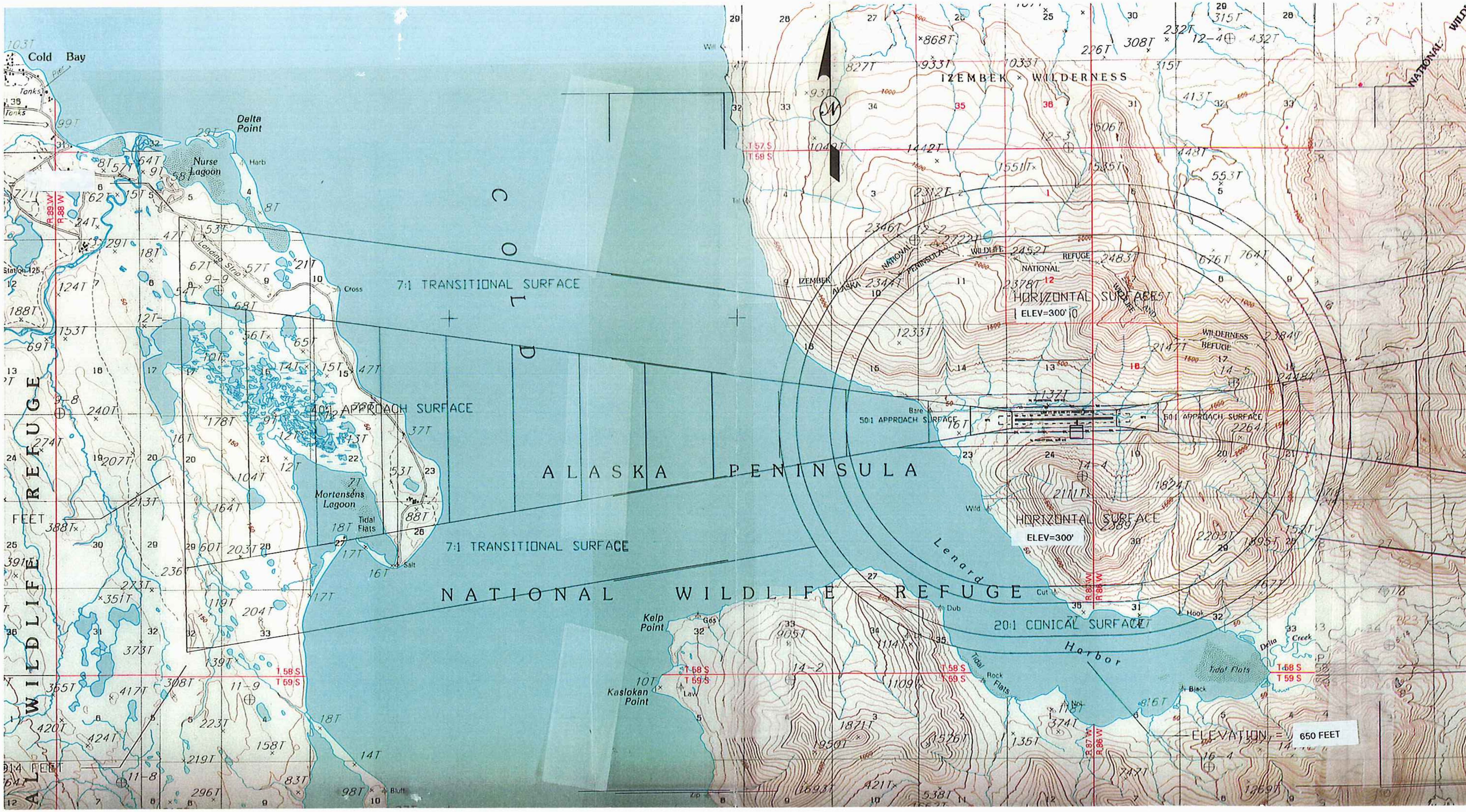
EXHIBIT E

1999 AUGUST



KING COVE AIRPORT ANALYSIS
ALTERNATIVE 3
LENARD HARBOR LOCATION

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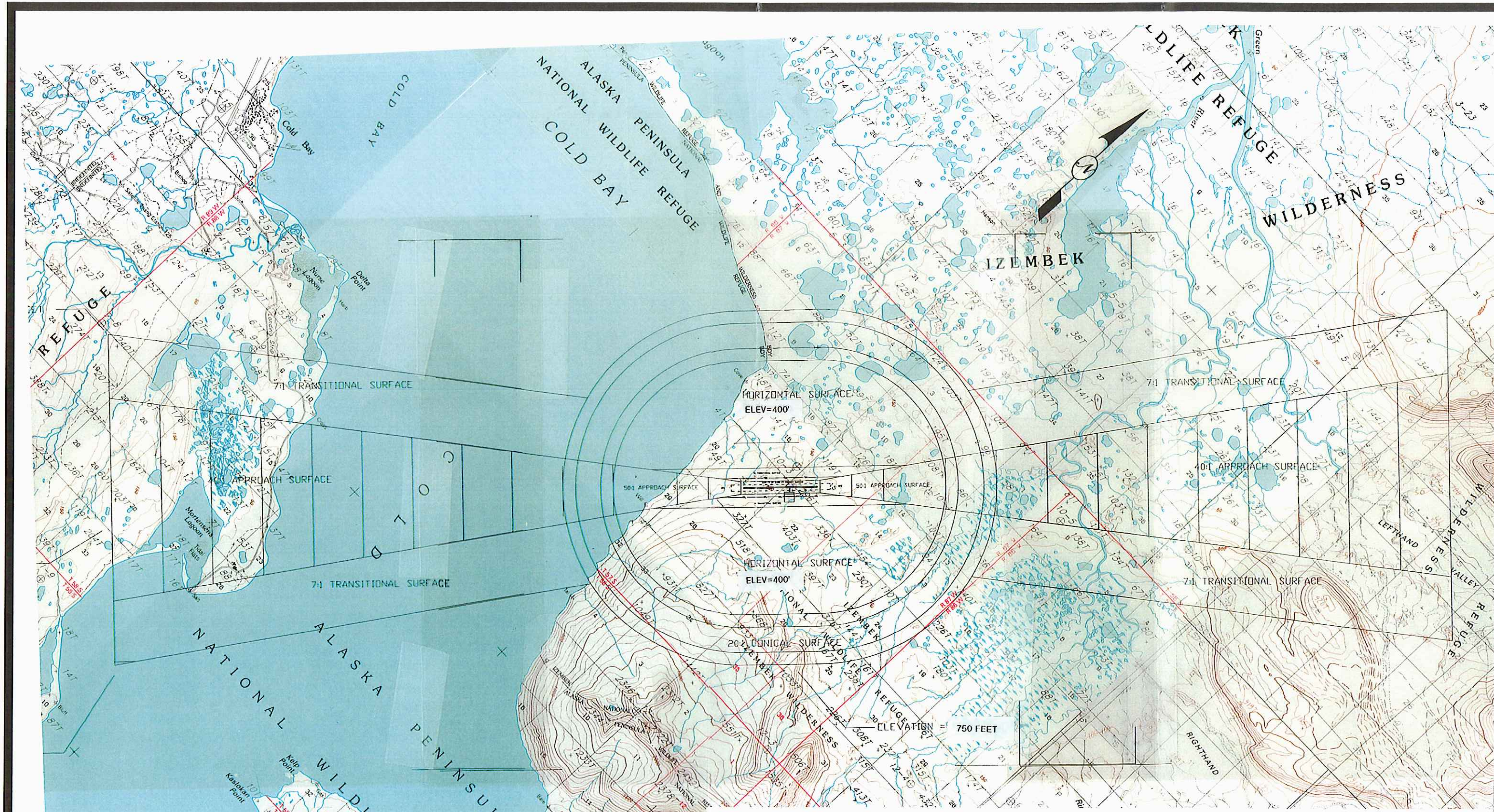
EXHIBIT F

1999 AUGUST



KING COVE AIRPORT ANALYSIS
ALTERNATIVE 4
HILLSIDE LOCATION

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EXHIBIT G

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ALTERNATIVE 5
JOSHUA GREEN RIVER LOCATION

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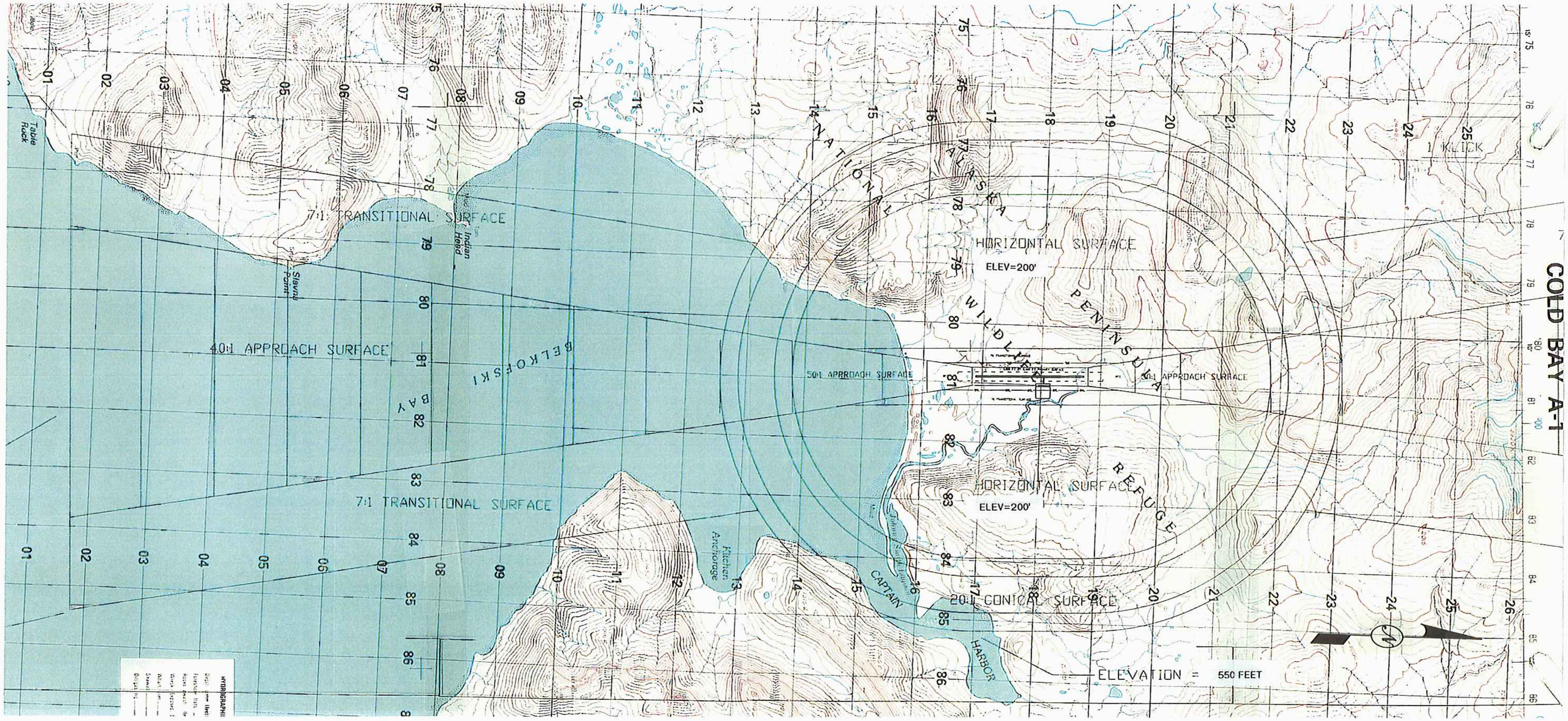
EXHIBIT H

1999 AUGUST



KING COVE AIRPORT ANALYSIS
ALTERNATIVE 6
BELKOVSKI BAY LOCATION

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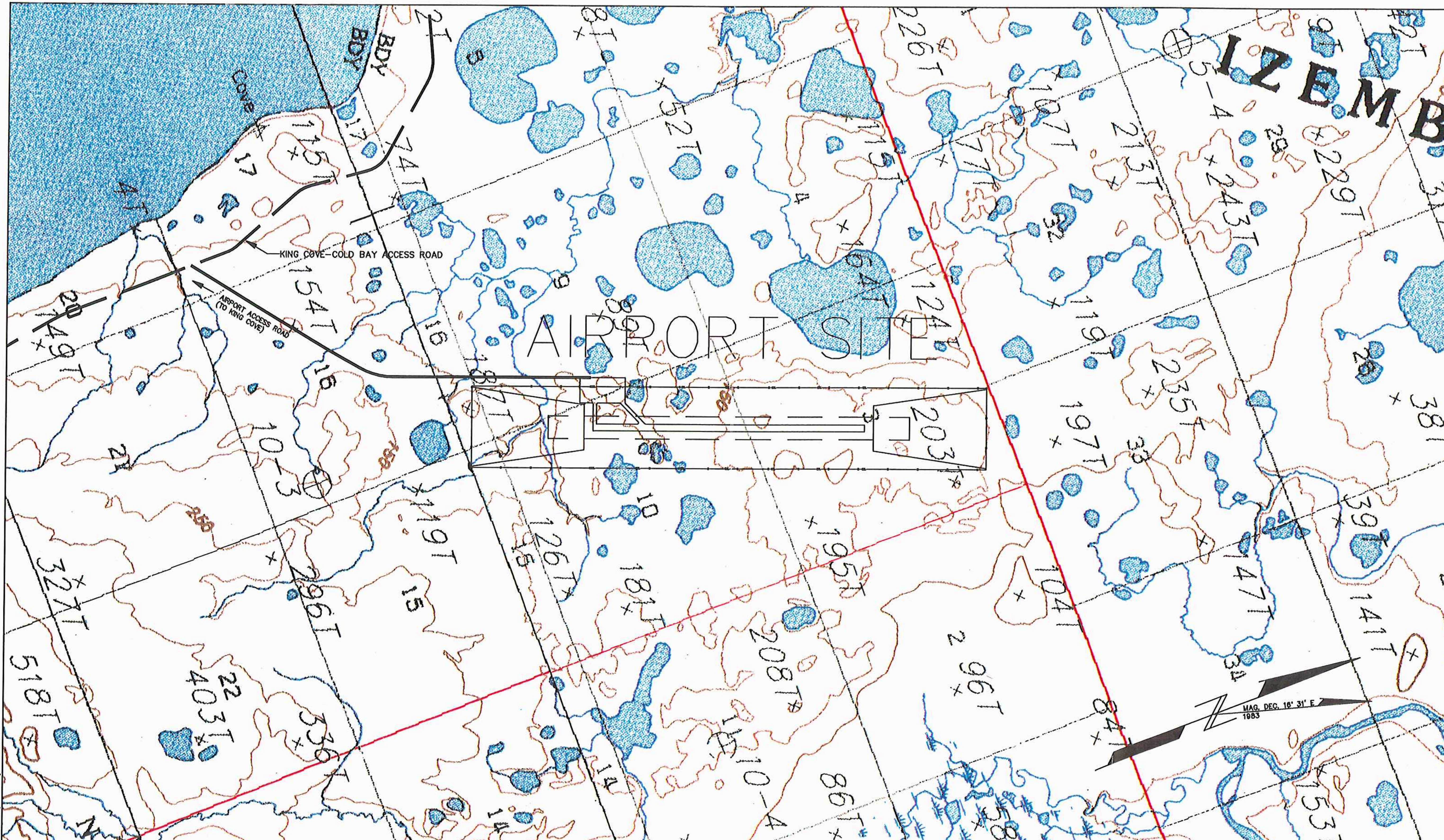
EXHIBIT I

1999 AUGUST



500 1000 2000

1" = 2000'

KING COVE AIRPORT ANALYSIS
CONCEPT AIRPORT LAYOUT PLAN
ALTERNATIVE 5

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EXHIBIT J

AUGUST 1999

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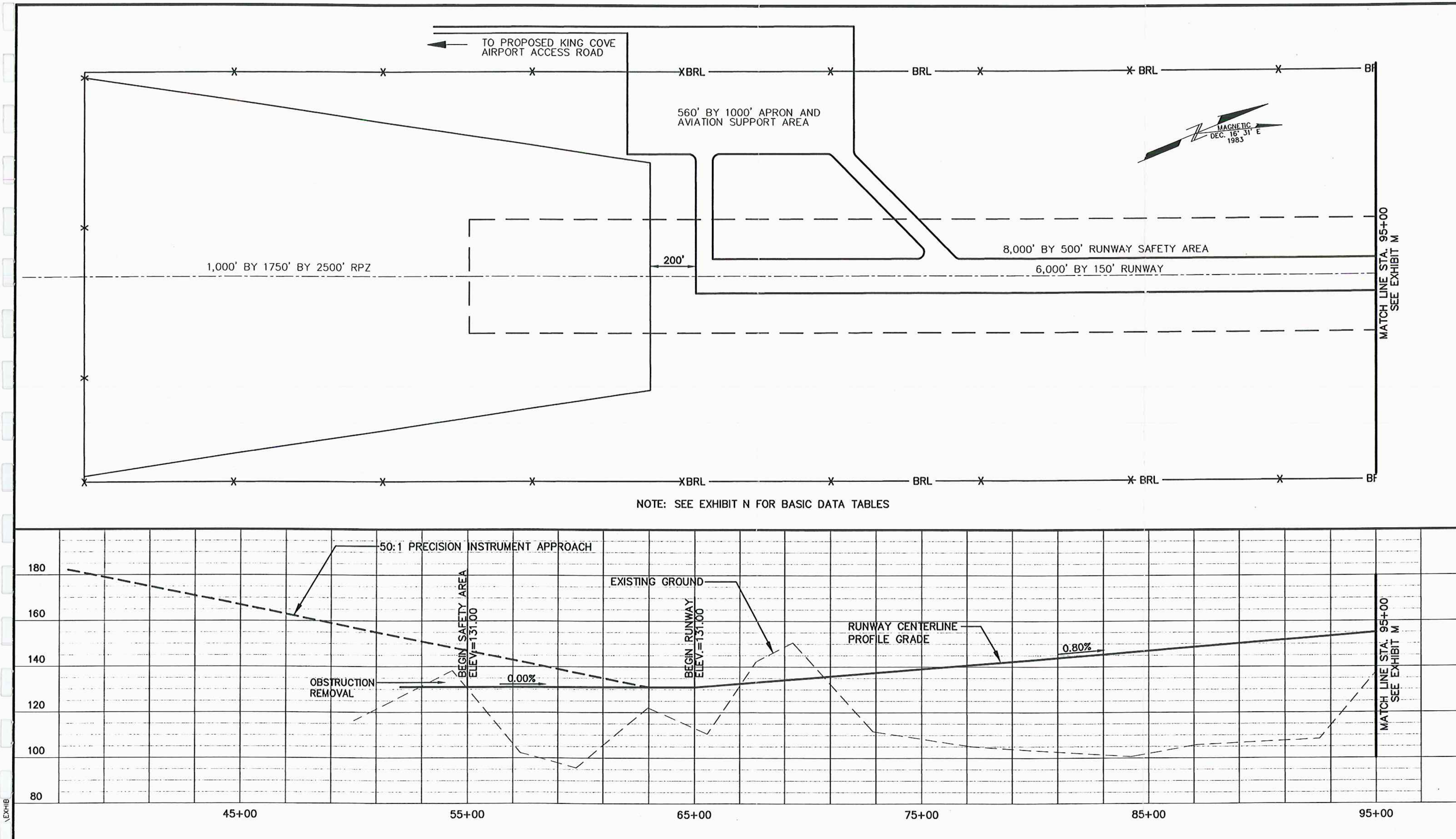
KING COVE AIRPORT ANALYSIS AERIAL PHOTO ALT. 5

EXHIBIT K

1999 AUGUST



125 250 500

1" = 400'

KING COVE AIRPORT ANALYSIS
PLAN AND PROFILE
STA 37+00 TO STA 95+00

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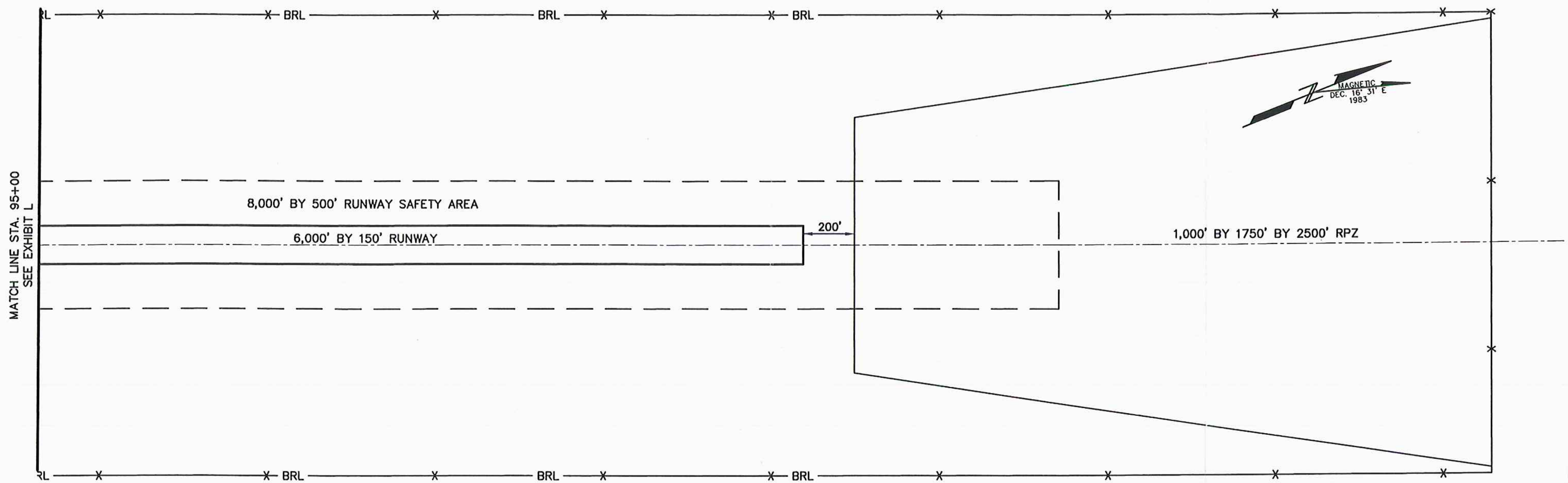
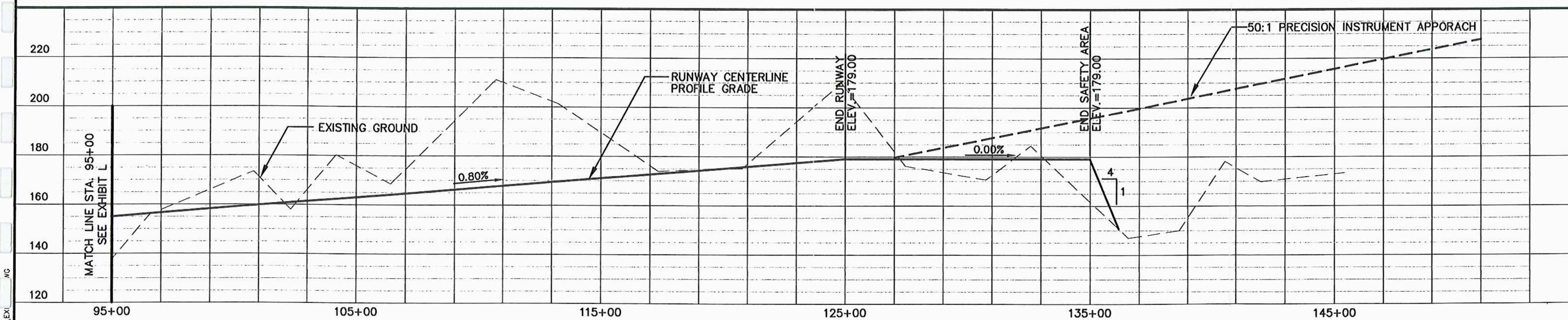
EXHIBIT L

1999 AUGUST



NOTE: SEE EXHIBIT N FOR BASIC DATA TABLES



125 250 500

1" = 400'

KING COVE AIRPORT ANALYSIS
PLAN AND PROFILE
STA 95+00 TO STA 153+00

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EXHIBIT M

1999 AUGUST

APPENDIX A

Monthly Wind Roses for Cold Bay, Alaska

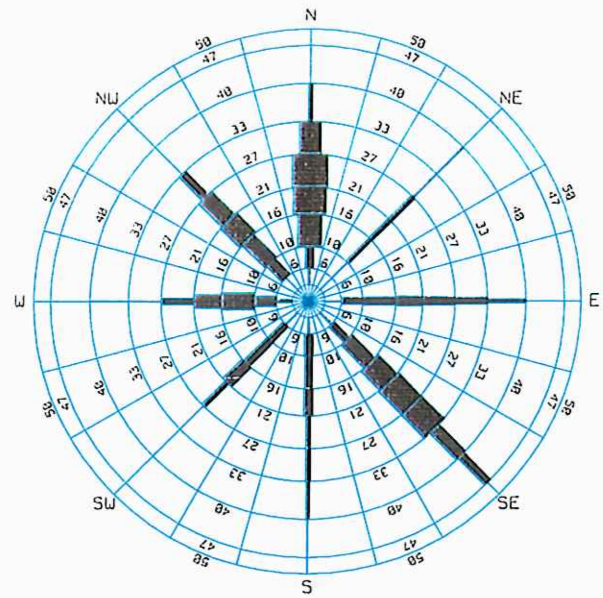


Figure A-4 – January Wind Rose for Cold Bay, Alaska

N	24.30	0.32	1.56	4.62	6.24	6.77	4.14	0.65	0.00	0.00	0.00
NE	3.76	0.16	0.22	0.81	0.91	0.91	0.38	0.38	0.00	0.00	0.00
E	8.06	0.22	1.24	1.40	1.72	1.51	1.24	0.70	0.05	0.00	0.00
SE	23.66	0.32	1.40	2.90	4.52	5.11	5.27	2.47	1.56	0.05	0.05
S	7.85	0.38	1.61	1.45	1.72	0.81	0.91	0.59	0.27	0.11	0.00
SW	6.56	0.27	1.34	1.56	2.31	0.91	0.11	0.05	0.00	0.00	0.00
W	9.73	0.54	1.88	3.12	2.53	1.18	0.32	0.16	0.00	0.00	0.00
NW	14.46	0.05	2.15	2.96	4.25	3.39	1.61	0.05	0.00	0.00	0.00
Calm	1.61	1.61									
	TOTALS	3.87	11.40	18.82	24.19	20.59	13.98	5.05	1.88	0.16	0.05
	Wind Speed [knots]	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	>=48
	Beaufort Scale	0-1	2	3	4	5	6	7	8	9	10

Table A-4 – Wind Speed and Direction, Cold Bay, Alaska
January

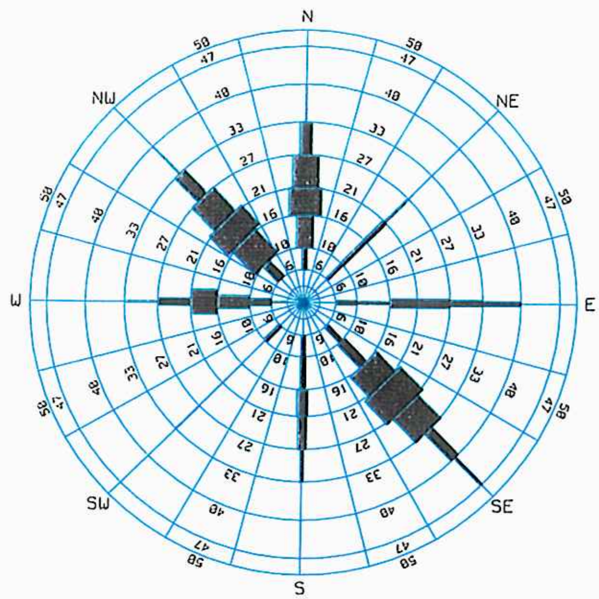


Figure A-5 – February Wind Rose for Cold Bay, Alaska

N	18.44	0.12	0.95	3.37	6.26	5.08	2.42	0.24	0.00	0.00	0.00
NE	2.96	0.06	0.65	0.83	0.95	0.41	0.06	0.00	0.00	0.00	0.00
E	6.50	0.06	0.77	0.41	1.65	1.65	1.12	0.83	0.00	0.00	0.00
SE	27.84	0.06	0.95	1.89	6.91	9.22	6.50	1.83	0.47	0.00	0.00
S	6.62	0.06	0.77	1.06	2.19	1.77	0.59	0.06	0.12	0.00	0.00
SW	1.54	0.06	0.83	0.06	0.18	0.12	0.30	0.00	0.00	0.00	0.00
W	10.22	0.30	1.24	2.48	4.55	1.30	0.35	0.00	0.00	0.00	0.00
NW	24.59	0.06	1.71	6.03	8.33	5.56	2.54	0.35	0.00	0.00	0.00
calm	1.30	1.30									
	TOTALS	2.07	7.86	16.13	31.03	25.12	13.89	3.31	0.59	0.00	0.00
Wind Speed [knots]		**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
Beaufort Scale		**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-5 – Wind Speed and Direction, Cold Bay, Alaska February

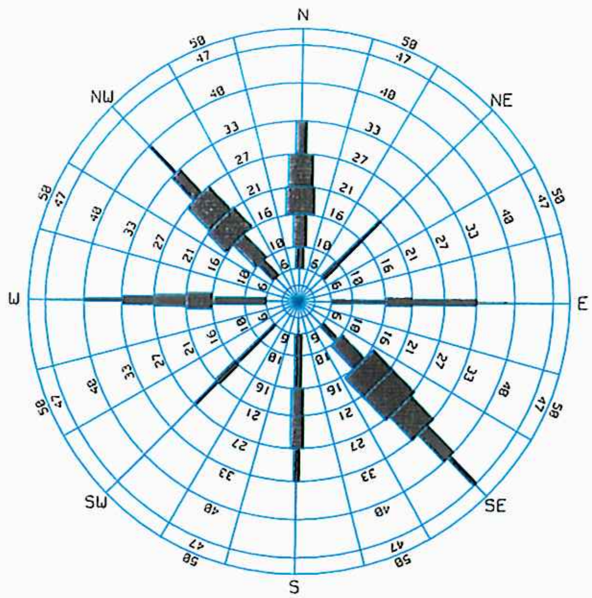


Figure A-6 – March Wind Rose for Cold Bay, Alaska

N	16.72	0.05	1.56	2.69	5.48	4.78	2.15	0.00	0.00	0.00	0.00
NE	2.58	0.05	1.02	0.70	0.54	0.22	0.05	0.00	0.00	0.00	0.00
E	5.86	0.11	0.75	0.65	1.56	1.08	1.24	0.32	0.16	0.00	0.00
SE	28.44	0.16	0.97	3.01	7.53	7.53	5.65	2.63	0.86	0.11	0.00
S	9.57	0.22	1.40	1.34	2.47	2.63	1.13	0.22	0.11	0.05	0.00
SW	3.49	0.00	0.59	0.70	1.24	0.54	0.16	0.11	0.16	0.00	0.00
W	10.70	0.16	1.29	1.34	3.06	2.31	1.67	0.54	0.32	0.00	0.00
NW	20.22	0.16	1.61	2.96	6.94	5.75	2.26	0.54	0.00	0.00	0.00
calm	2.42	2.42									
	TOTALS	3.33	9.19	13.39	28.82	24.84	14.30	4.35	1.61	0.16	0.00
Wind Speed [knots]		**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
Beaufort Scale		**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-6 – Wind Speed and Direction, Cold Bay, Alaska March

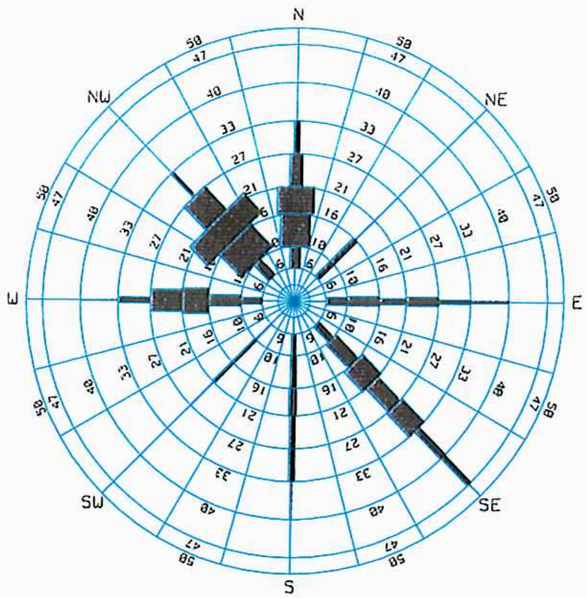


Figure A-7 – April Wind Rose for Cold Bay, Alaska

N	18.72	0.06	2.06	5.83	7.17	2.56	1.06	0.00	0.00	0.00	0.00
NE	2.50	0.06	1.06	1.11	0.17	0.11	0.00	0.00	0.00	0.00	0.00
E	7.17	0.11	1.44	1.72	1.06	1.61	0.72	0.50	0.00	0.00	0.00
SE	18.67	0.00	1.39	2.72	4.89	3.22	4.00	1.28	0.94	0.22	0.00
S	6.11	0.11	0.83	1.11	1.39	1.00	1.22	0.33	0.11	0.00	0.00
SW	1.89	0.06	0.28	0.56	0.56	0.28	0.06	0.06	0.06	0.00	0.00
W	13.33	0.06	1.17	2.06	4.72	4.06	1.00	0.28	0.00	0.00	0.00
NW	30.28	0.06	1.67	8.22	14.17	5.56	0.61	0.00	0.00	0.00	0.00
calm	1.33	1.33									
	TOTALS	1.83	9.89	23.33	34.11	18.39	8.67	2.44	1.11	0.22	0.00
	Wind Speed [knots]	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
	Beaufort Scale	**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-7 – Wind Speed and Direction, Cold Bay, Alaska
April

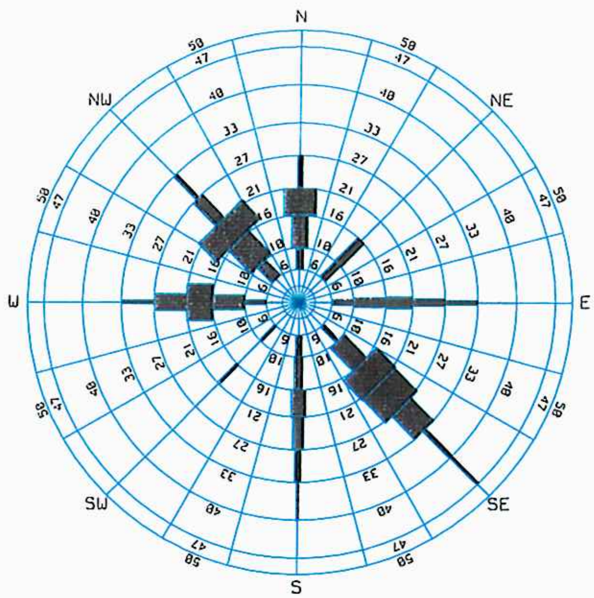


Figure A-8 – May Wind Rose for Cold Bay, Alaska

N	11.61	0.11	1.34	3.12	6.13	0.91	0.00	0.00	0.00	0.00	0.00
NE	3.33	0.05	1.45	1.67	0.16	0.00	0.00	0.00	0.00	0.00	0.00
E	7.53	0.11	1.08	1.77	2.26	1.29	0.81	0.22	0.00	0.00	0.00
SE	28.33	0.05	0.86	3.66	8.82	8.39	5.05	0.81	0.54	0.16	0.00
S	9.57	0.05	1.13	1.61	2.85	2.15	1.18	0.48	0.11	0.00	0.00
SW	1.56	0.05	0.59	0.16	0.59	0.16	0.00	0.00	0.00	0.00	0.00
W	14.35	0.22	0.81	2.74	6.83	3.12	0.65	0.00	0.00	0.00	0.00
NW	22.47	0.05	2.26	5.38	11.51	2.42	0.86	0.00	0.00	0.00	0.00
calm	1.24	1.24									
	TOTALS	1.94	9.52	20.11	39.14	18.44	8.55	1.51	0.65	0.16	0.00
	Wind Speed [knots]	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	>=48
	Beaufort Scale	0-1	2	3	4	5	6	7	8	9	10

Table A-8 – Wind Speed and Direction, Cold Bay, Alaska May

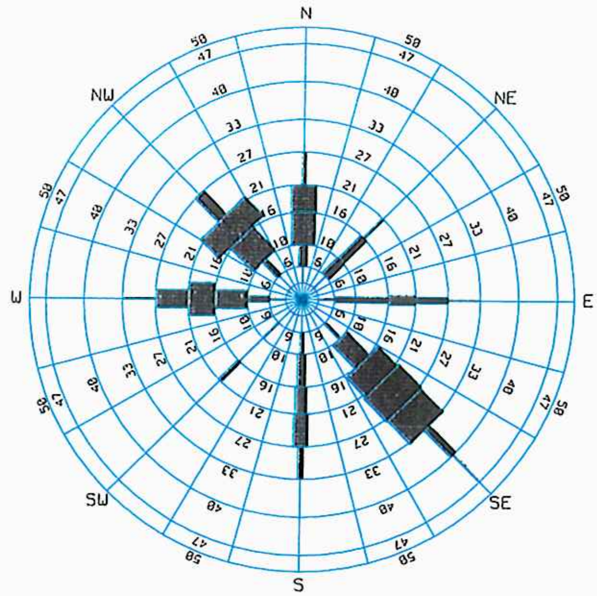


Figure A-9 – June Wind Rose for Cold Bay, Alaska

N	12.00	0.22	1.61	4.56	4.94	0.67	0.00	0.00	0.00	0.00	0.00
NE	4.00	0.22	1.83	1.50	0.44	0.00	0.00	0.00	0.00	0.00	0.00
E	5.61	0.28	1.06	1.06	1.78	1.11	0.33	0.00	0.00	0.00	0.00
SE	32.22	0.17	0.50	3.78	8.28	9.17	8.61	1.44	0.28	0.00	0.00
S	8.72	0.06	0.67	1.61	2.33	2.94	1.06	0.06	0.00	0.00	0.00
SW	1.44	0.06	0.39	0.17	0.78	0.06	0.00	0.00	0.00	0.00	0.00
W	14.33	0.28	1.00	3.39	6.06	3.33	0.28	0.00	0.00	0.00	0.00
NW	20.50	0.06	1.06	5.78	11.39	2.22	0.00	0.00	0.00	0.00	0.00
calm	1.17	1.17									
	TOTALS	2.50	8.11	21.83	36.00	19.50	10.28	1.50	0.28	0.00	0.00
	Wind Speed [knots]	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
	Beaufort Scale	**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-9 – Wind Speed and Direction, Cold Bay, Alaska
June

BASIC DATA TABLE

RUNWAY DATA

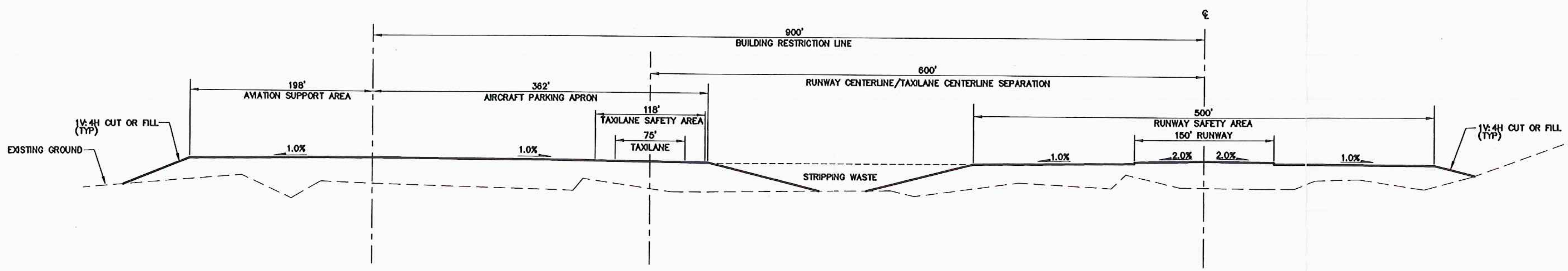
	PROPOSED RUNWAY 01/19
RUNWAY LENGTH	6000 FEET
RUNWAY WIDTH	100 FEET (150 FEET)[1]
RUNWAY SAFETY AREA LENGTH (BEYOND END OF RUNWAY)	1000 FEET
RUNWAY SAFETY AREA WIDTH	500 FEET
BUILDING RESTRICTION LINE	900 FEET
RUNWAY PROTECTION ZONE	1000' X 1750' X 2500'
RUNWAY OBJECT FREE AREA LENGTH (BEYOND RUNWAY END)	1000 FEET
RUNWAY OBJECT FREE AREA WIDTH	800 FEET
RUNWAY SHOULDER WIDTH	10 FEET
RUNWAY C/L TO T/W OR T/L C/L	600 FEET
TAXIWAY/TAXILANE WIDTH	50 FEET (75 FEET)[1]
TAXIWAY/TAXILANE S. A. WIDTH	118 FEET
AIRCRAFT PARKING LINE	770 FEET

1) WIDTH RECOMMENDED BECAUSE OF CROSSWINDS, ICE, AND SNOW.

BASIC DATA TABLE

AIRPORT DATA

AIRPORT ELEVATION (M.S.L.)	179 FEET (M.S.L)
AIRPORT REFERENCE POINT	LAT. 55°16'55" LONG. 162°27'48"
MEAN DAILY MAX. HOTTEST MONTH (COLD BAY)	55.2° F
WIND COVERAGE AT 16 KNOTS (%)	71 %
AIRPORT REFERENCE CODE (ARC)	C–III
RUNWAY LIGHTING	HIRL
NAVIGATION AIDS	INSTRUMENT LANDING SYSTEM



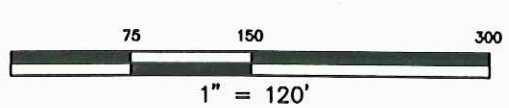


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EXHIBIT N

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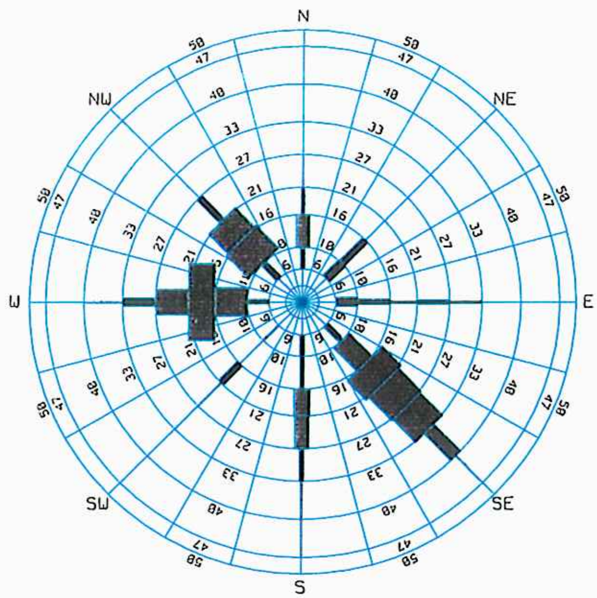

Figure A-10 – July Wind Rose for Cold Bay, Alaska

N	4.19	0.00	0.86	2.58	0.54	0.22	0.00	0.00	0.00	0.00	0.00
NE	3.28	0.11	1.77	1.34	0.05	0.00	0.00	0.00	0.00	0.00	0.00
E	4.14	0.00	1.61	0.91	0.48	0.70	0.43	0.00	0.00	0.00	0.00
SE	32.20	0.11	1.08	3.98	9.14	7.85	7.20	2.63	0.22	0.00	0.00
S	8.66	0.00	0.81	0.70	3.06	2.69	0.86	0.32	0.22	0.00	0.00
SW	2.37	0.05	0.38	0.11	1.34	0.32	0.11	0.05	0.00	0.00	0.00
W	26.40	0.00	0.75	5.22	14.09	4.68	1.40	0.22	0.05	0.00	0.00
NW	17.63	0.16	1.29	7.85	6.99	1.34	0.00	0.00	0.00	0.00	0.00
calm	1.13	1.13									
	TOTALS	1.56	8.55	22.69	35.70	17.80	10.00	3.23	0.48	0.00	0.00
	Wind Speed [knots]	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
	Beaufort Scale	**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-10 – Wind Speed and Direction, Cold Bay, Alaska
July

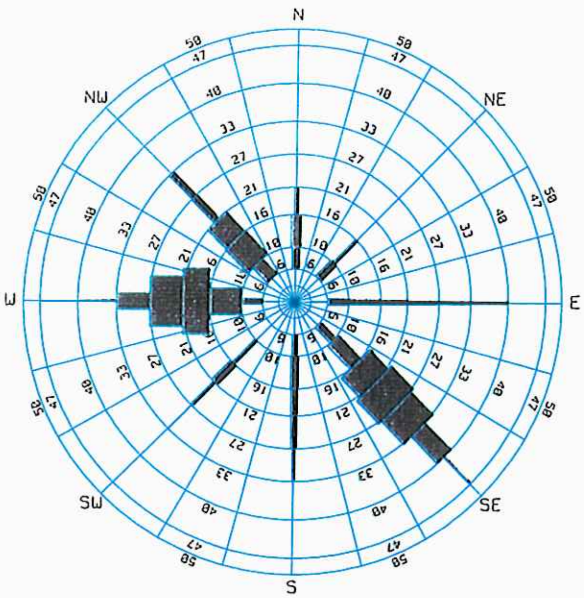

Figure A-11 – August Wind Rose for Cold Bay, Alaska

N	3.98	0.05	1.34	1.83	0.75	0.00	0.00	0.00	0.00	0.00	0.00
NE	2.15	0.00	1.51	0.54	0.05	0.05	0.00	0.00	0.00	0.00	0.00
E	5.05	0.16	1.18	0.97	0.91	0.70	0.59	0.54	0.00	0.00	0.00
SE	33.17	0.05	1.40	2.90	7.58	9.25	7.90	3.76	0.32	0.00	0.00
S	5.27	0.11	0.97	1.40	1.13	1.08	0.43	0.16	0.00	0.00	0.00
SW	3.01	0.00	0.11	0.65	1.56	0.54	0.16	0.00	0.00	0.00	0.00
W	30.81	0.05	0.97	4.89	12.15	9.30	3.06	0.27	0.11	0.00	0.00
NW	15.16	0.00	2.58	5.22	4.84	1.40	1.13	0.00	0.00	0.00	0.00
calm	1.40	1.40									
	TOTALS	1.83	10.05	18.39	28.98	22.31	13.28	4.73	0.43	0.00	0.00
Wind Speed [knots]		**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
Beaufort Scale		**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-11 – Wind Speed and Direction, Cold Bay, Alaska
August

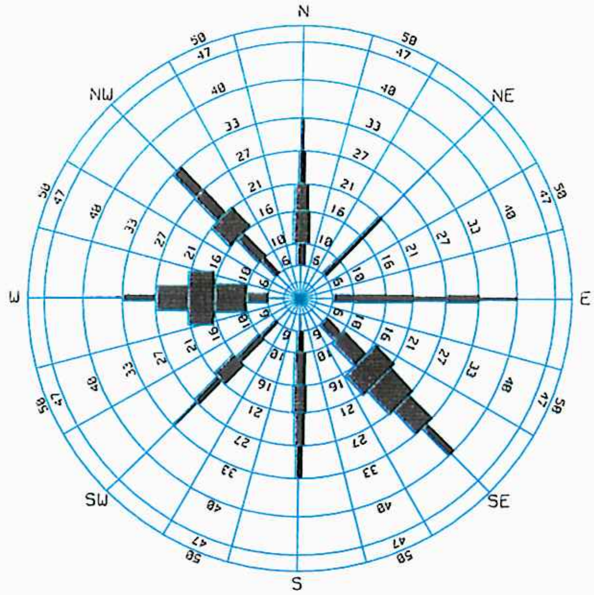

Figure A-12 – September Wind Rose for Cold Bay, Alaska

N	9.33	0.06	1.67	3.22	2.72	1.22	0.44	0.00	0.00	0.00	0.00
NE	3.11	0.06	1.00	0.83	0.83	0.22	0.17	0.00	0.00	0.00	0.00
E	7.28	0.00	1.33	1.56	1.44	0.89	1.44	0.56	0.00	0.06	0.00
SE	25.50	0.06	1.94	3.28	8.22	6.28	4.28	1:39	0.06	0.00	0.00
S	9.44	0.28	1.17	2.17	2.61	1.94	1.17	0.11	0.00	0.00	0.00
SW	7.06	0.11	0.78	1.44	2.94	1.33	0.44	0.00	0.00	0.00	0.00
W	23.28	0.17	1.83	5.22	9.83	4.72	1.11	0.22	0.17	0.00	0.00
NW	13.44	0.11	1.11	1.94	5.56	2.50	2.11	0.11	0.00	0.00	0.00
calm	1.56	1.56									
	TOTALS	2.39	10.83	19.67	34.17	19.11	11.17	2.39	0.22	0.06	0.00
	Wind Speed [knots]	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
	Beaufort Scale	**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-12 – Wind Speed and Direction, Cold Bay, Alaska September

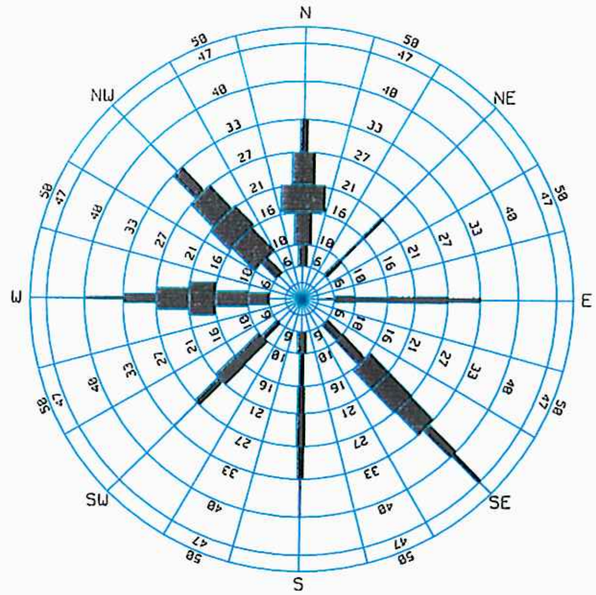

Figure A-13 – October Wind Rose for Cold Bay, Alaska

N	19.46	0.16	1.77	3.39	8.28	4.41	1.40	0.05	0.00	0.00	0.00
NE	1.99	0.00	0.81	0.43	0.54	0.22	0.00	0.00	0.00	0.00	0.00
E	5.27	0.22	1.13	0.81	1.08	1.18	0.75	0.05	0.05	0.00	0.00
SE	19.03	0.05	1.51	1.88	4.57	4.57	3.98	1.56	0.70	0.16	0.05
S	7.42	0.00	1.77	0.86	1.29	1.67	1.13	0.38	0.11	0.16	0.05
SW	7.58	0.11	0.97	2.37	2.69	1.24	0.22	0.00	0.00	0.00	0.00
W	17.42	0.05	2.31	2.85	6.08	3.98	1.61	0.43	0.11	0.00	0.00
NW	20.97	0.11	1.61	5.27	6.51	5.05	2.26	0.16	0.00	0.00	0.00
calm	0.86	0.86									
	TOTALS	1.56	11.88	17.85	31.02	22.31	11.34	2.63	0.97	0.32	0.11
	Wind Speed [knots]	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
	Beaufort Scale	**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-13 – Wind Speed and Direction, Cold Bay, Alaska October

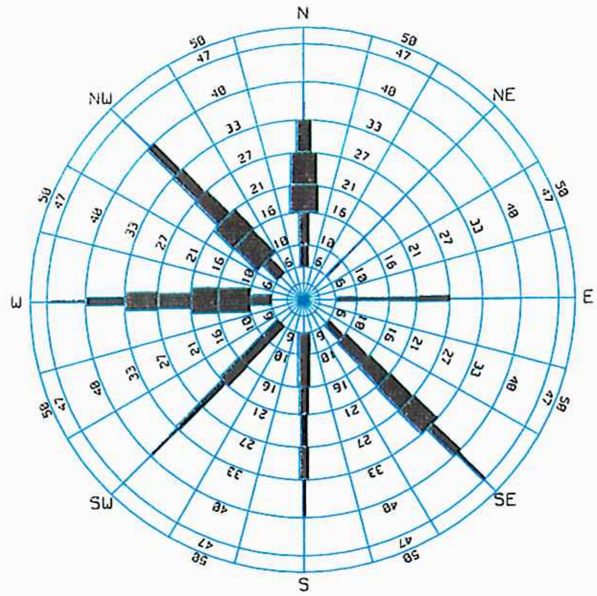

Figure A-14 – November Wind Rose for Cold Bay, Alaska

N	17.17	0.06	1.56	1.94	5.50	5.00	2.89	0.22	0.00	0.00	0.00
NE	1.39	0.06	0.44	0.33	0.22	0.22	0.11	0.00	0.00	0.00	0.00
E	3.28	0.00	0.78	0.50	0.72	1.00	0.17	0.11	0.00	0.00	0.00
SE	17.44	0.06	1.28	2.44	3.22	3.78	4.28	1.72	0.56	0.06	0.06
S	9.89	0.06	2.39	2.33	1.72	1.17	1.72	0.44	0.06	0.00	0.00
SW	9.11	0.11	1.94	2.06	2.39	1.11	0.94	0.44	0.11	0.00	0.00
W	19.17	0.06	1.89	4.50	4.78	2.83	3.44	1.39	0.28	0.00	0.00
NW	20.33	0.11	2.00	4.89	5.61	3.28	2.44	1.72	0.28	0.00	0.00
calm	2.22	2.22									
	TOTALS	2.72	12.28	19.00	24.17	18.39	16.00	6.06	1.28	0.06	0.06
	Wind Speed [knots]	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**41-47**	**>=48**
	Beaufort Scale	**0-1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Table A-14 – Wind Speed and Direction, Cold Bay, Alaska November

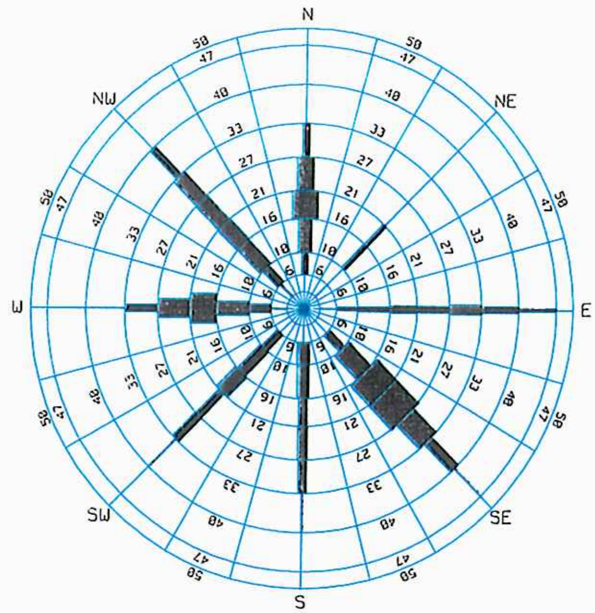

Figure A-15 – December Wind Rose for Cold Bay, Alaska

N	13.39	0.05	1.18	2.69	4.89	3.28	1.29	0.00	0.00	0.00	0.00
NE	2.10	0.22	0.05	0.86	0.81	0.11	0.05	0.00	0.00	0.00	0.00
E	7.42	0.22	0.59	0.86	1.29	1.08	1.72	1.08	0.54	0.05	0.00
SE	25.91	0.00	1.45	3.76	6.94	7.04	4.46	1.94	0.22	0.05	0.05
S	10.48	0.16	2.42	2.37	1.67	1.88	1.56	0.38	0.05	0.00	0.00
SW	10.16	0.05	1.51	2.15	2.96	1.45	1.67	0.32	0.05	0.00	0.00
W	14.73	0.27	1.51	2.53	5.32	3.39	1.34	0.22	0.16	0.00	0.00
NW	14.95	0.38	1.61	2.80	3.12	2.90	2.80	1.34	0.00	0.00	0.00
calm	0.86	0.86									
	TOTALS	2.20	10.32	18.01	26.99	21.13	14.89	5.27	1.02	0.11	0.05
	Wind Speed [knots]	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	>=48
	Beaufort Scale	0-1	2	3	4	5	6	7	8	9	10

Table A-15 – Wind Speed and Direction, Cold Bay, Alaska December

APPENDIX B

Geotechnical Conditions

Proposed King Cove Airport

Duane Miller & Associates *Arctic & Geotechnical Engineering*
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(907) 346-1021, Facsimile 346-1636, E-mail: Duane_Miller@Compuserve.com

June 30, 1999

USKH
2515 A Street
Anchorage, AK 99503

Attention: Earl Korynta, P.E. (fax 258-4653)

Subject: Geotechnical conditions
Proposed New Airport
King Cove Access, Alaska
DM&A Job No. 4171.01

The Aleutians East Borough is evaluating a number of options for providing the Community of King Cove with safe, dependable access. One option includes the construction of a new airport capable of accommodating Boeing 737 aircraft or equivalent. The site selected for the airport is near the head of Cold Bay to the south and east of the Izembek Wilderness Area (see Plate 1). Duane Miller & Associates, as geotechnical engineer for the project, is working with the engineering design team to provide geotechnical data needed to develop a cost estimate for the proposed airport project. Our goal is to describe geologic conditions at the proposed site and to develop recommendations regarding geotechnical aspects of site grading and potential material sources.

After a short meeting with Earl Korynta and Steve Cinelli at USKH and reviewing previous work in the Cold Bay area, a study of air photos of the proposed site was undertaken and a reconnaissance level geotechnical exploration plan was developed. The airport reconnaissance was performed in conjunction with the work performed for the roadway study.

On May 18, 1999, geologist Bob Dugan and Walt Phillips spent about two hours on site supported by a Bell 206-L helicopter supplied by Air Logistics of Fairbanks. Our field investigation consisted of a surface evaluation of soil and drainage conditions. Pertinent aspects of the terrain were photographed and soil samples were collected at locations thought to be typical of the surrounding area. The locations visited are shown on Plate 1 as 6.1 through 6.3. The samples were tested in the laboratory for moisture content and classification and that data is presented on Plate 2.

The proposed airport site is located on the southern edge of the Nushagak-Bristol Bay Lowland, just north of the Aleutian Range Physiographic Province. The site terrain is composed of rolling hills and lakes, typical of areas underlain by deposits laid down by stagnant or retreating glaciers. Hummocky conditions are common. Relief is generally less than 100 feet and drainage patterns are fairly well defined. The numerous thaw depressions often contain shallow lakes bordered by swampy areas. Steep volcanic mountains of the Aleutian Range partially block direct flight access to the site from the south.

The morainal (Qd) and outwash (Qo) uplands at the airport site are composed of sandy gravel and gravelly sand with varying amounts of interstitial silt. Volcanic ash mixed with organic silt blankets most of the area. On some hilltops frost-rived gravelly deposits are exposed but from one to three feet of fine surficial material is common throughout the area. In the lowlands near the lakes, swamp deposits (Qs) also consist of thicker volcanic ash and organics that are saturated by groundwater and often more than four feet thick.

The volcanic ash has a classification of non-plastic silt to sandy silt with moderate to large amounts of organic matter. Moisture contents in the ash are quite high. The samples tested in the laboratory show moisture contents varying from 50% to 90% and organic contents of 17% to more than 30%. The volcanic ash is not suitable for use as a fill material. When the material is disturbed, it becomes sloppy and is too wet to place and compact. The ash can be overlaid by fill to form the airport embankment or can be removed by excavation to expose the granular glacial soils. Some compression and settlement will occur if the ash is overlaid; for embankments up to 5 feet thick, I would estimate that a 3-foot thickness of ash will compress 6 to 12 inches.

Due to the ashy surface cover and to minimize snow drifting it is suggested that overlay construction be utilized as much as practical. The higher ridges can be cut and used for unclassified fill. Even on the ridges some surficial material will have to be wasted. Most of the outwash material is expected to be suitable for embankment fill, and if the on site borrow material were scalped with a 3-

inch grizzly, some material suitable for crushing might be obtained. Additional crushed rock sources are present about five miles south along the proposed access road. The volcanic talus slopes along the eastern shore of Cold Bay should provide a nearly unlimited supply of rock suitable for crushed aggregate.

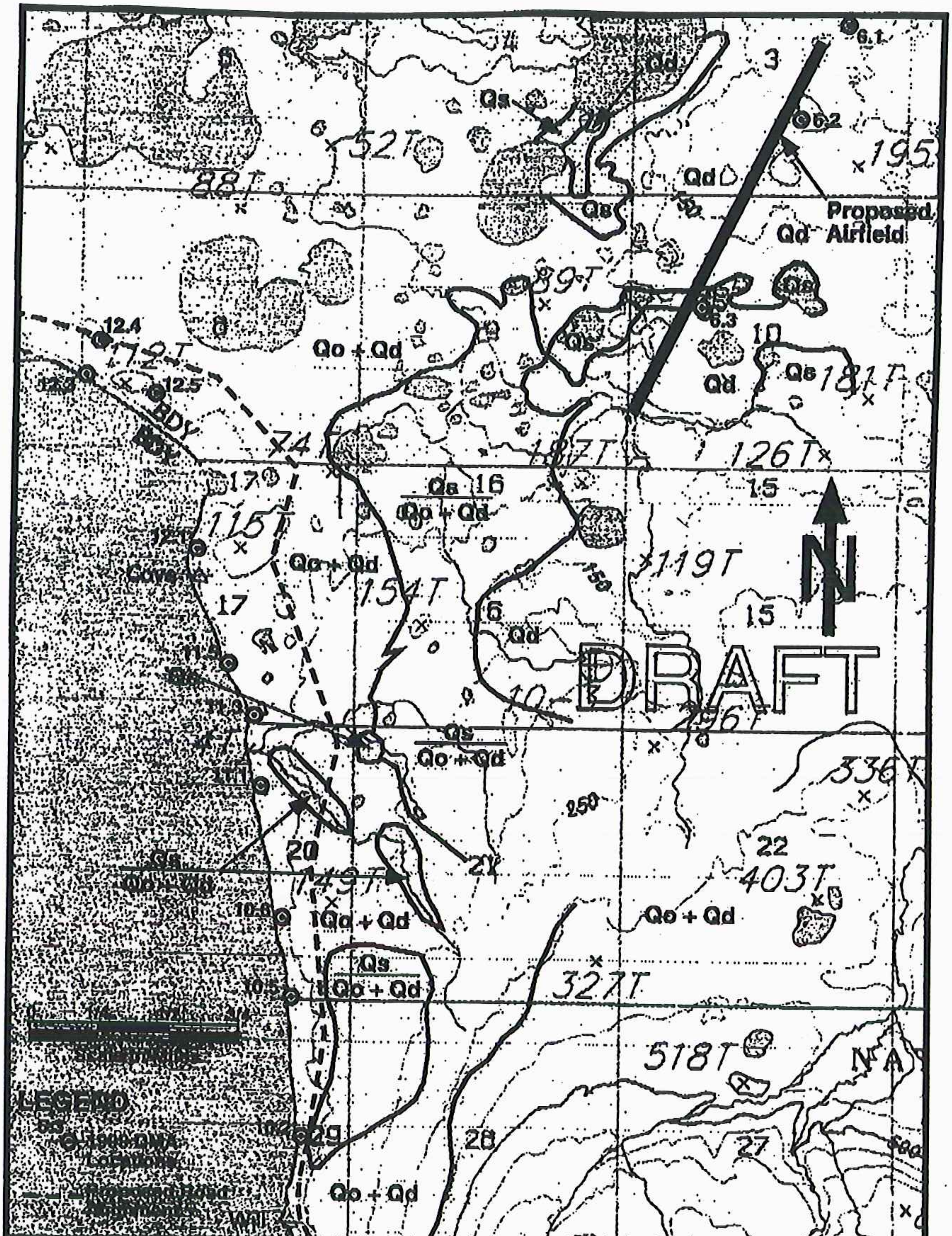
Please call me if you have questions.

Very truly yours,

Duane L. Miller

Duane L. Miller, P.E.

Attachment: Plate 1, Map of Geological Units
Plate 2, Laboratory Test Data



Reference: USGS Quadrangle Cold Bay (A2) & (B2) Alaska, 1995.

Duane Miller & Associates
Arctic & Geotechnical Engineering

Job No.: 4171.01
Date : June 1999

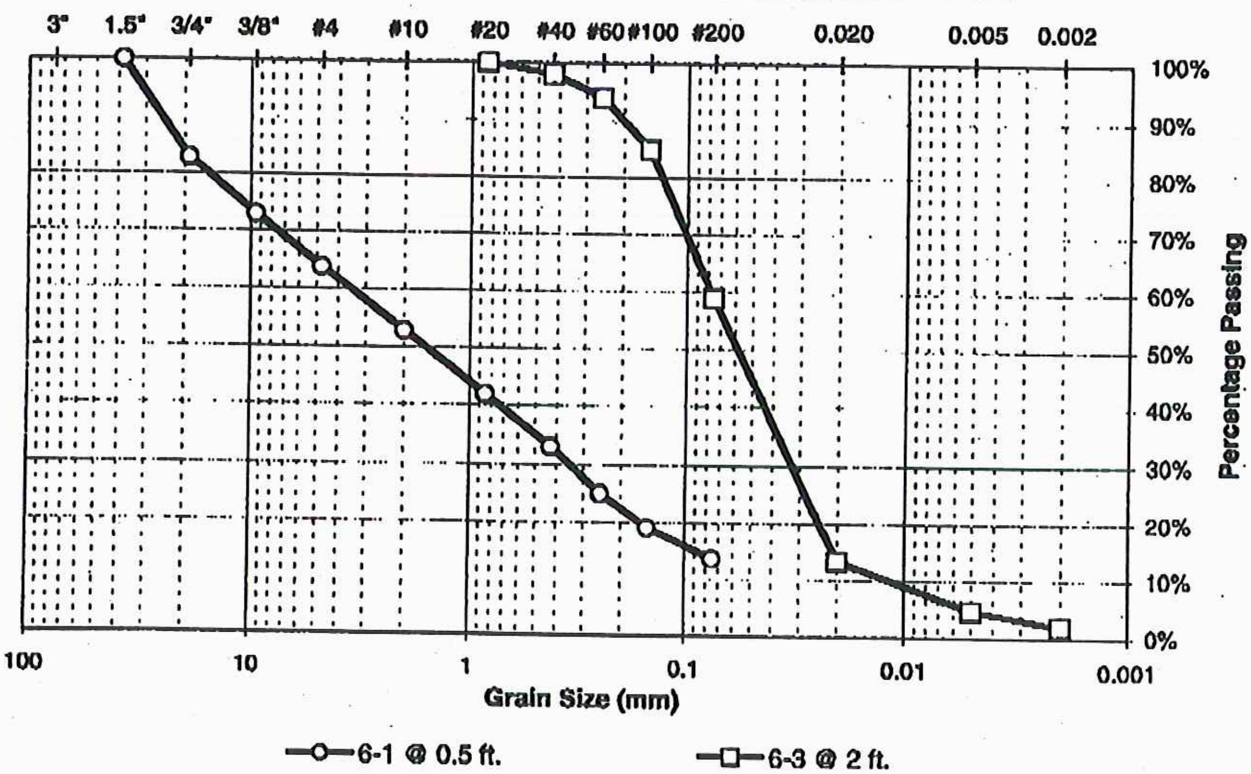
GEOLOGICAL UNITS
Airport Site
King Cove Access, Alaska

Plate
1

Sample Location	6-1	6-3	6-3
Depth =>	0.5 ft.	1.0 ft.	2.0 ft.
Moisture Content =>	11.6%	68.8%	51.7%
Organic Content =>		26.9%	
3" =>			
1 1/2" =>	100%		
3/4" =>	83%		
3/8" =>	73%		
#4 =>	64%		
#10 =>	53%		
#20 =>	42%		100%
#40 =>	33%		98%
#60 =>	25%		94%
#100 =>	19%		85%
#200 =>	13.6%		59.0%
0.02 mm			13.3%
0.005 mm			4.6%
0.002 mm			1.9%

Analysis of Data

D10 size =>	0.053 mm		0.012 mm
D30 size =>	0.348 mm		0.032 mm
D50 size =>	1.584 mm		0.058 mm
D60 size =>	3.468 mm		0.077 mm
Coeff. of Uniformity, Cu =	65.61		6.52
Coeff. of Curvature, Cc =	0.66		1.15
Gravel (+#4) percentage =	36.0%		0.0%
Sand percentage =	50.4%		41.0%
Fines percentage =	13.6%		59.0%
Unified Soil Class Symbol =	SM	OL	OL



LABORATORY TEST DATA
Airport Site
King Cove Access, Alaska